THE IRON TRADE REVIEW

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THE WEEK IN IRON CIRCLES.

THE MARKET AT LARGE.

The iron market gathers strength, but there are already evidences that prices may be pushed beyond the line of safety, even with the entire trade protesting that they are high enough. The large purchases of Bessemer pig iron last week, taking up the bulk of the available metal for the first half of the year, have made that market particularly sensitive, and purchases of several thousand tons in the Pittsburg district in the past week have advanced the price to $16.25 at Valley furnace, with higher prices for early shipments. Basic iron has also advanced, and Central Western steel works have taken 10,000 to 15,000 tons of Southern basic, failing to find further needed supplies available from Northern furnaces. The market is now $17 Pittsburg, on a level with Bessemer iron. These strong conditions in the market for steel-making pig iron are paralleled by higher prices for steel and by preparations for further imports of German billets and sheet bars. Sales of foreign sheet bars have been made at $28.50 Atlantic port, and several lots are reported sold at close to $31 at buyer's mill. The independent sheet mills are feeling the pinch of conditions in the steel market, and a meeting is appointed for Pittsburg early in February to consider this question, as well as the possibility of concerted action in the sheet market. Improvement continues to be noted in the supply of coke for blast furnaces and the output of pig iron is increasing again, though at the opening of the year it was reported to be at the rate of 298,460 tons a week, as against 324,761 tons on Dec. 1. Furnaces producing foundry iron are selling steadily, without change in prices, the bulk of the business being for delivery in the second half of the year—Southern iron at $12 Birmingham for No. 2, and Eastern iron at $16 Lehigh Valley furnace. In the finished material market there has been one advance in the week, a large producer of bar iron quoting 1.60c Pittsburg, an advance of $2 a ton. The leading manufacturer of bar iron withdrew prices on Wednesday of this week, and an advance is expected to follow. The effect of this action will naturally be to turn bar tonnage to steel unless an advance is made by the manufacturers of the latter, which does not seem likely. Some dissatisfaction with the Pittsburg base on bar iron has been expressed by consumers west of Pittsburg, and it is probable that a meeting of producers to be held next week will consider this matter. The consumption of bars by car works is beyond precedent. In the past week bolt and nut works in the Central West have been considerable buyers, and the requirements of agricultural works will be greater than originally computed. Lake shipyards, with a record-breaking tonnage on their books, are making figures on more vessels, and inquiries for 17,000 tons of material have been made on this account in the past week. The prospects of structural mills are enlarged each week. Pittsburg reports bridge and building projects close to the contract stage that will require 25,000 tons of shapes. There are already indications of such pressure upon structural mills in the spring months as may hamper building. The producers of Lake Superior Bessemer ores are holding their first formal meeting at this writing, and it is expected that definite announcement will be made in the coming week concerning business for 1902.

PITTSBURG.

OFFICE OF *The Iron Trade Review*,
429 PARK BUILDING, JAN. 22.

In both raw and finished material the iron and steel market is gaining strength daily, and while prices have not advanced materially the condition is one of extreme firmness. Both pig iron and billets have advanced slightly during the week and the situation in both these commodities is decidedly acute. Sales of Southern basic have been made in this territory during the week amounting to about 10,000 tons at $17.15, Pittsburg, which is about 15 cents above the price of Northern basic, sold here last week. While $16 at the furnace was done on several large lots of Bessemer iron, the average price secured by the furnacemen was $16.25 at the furnace and sales for spot shipment were made at prices ranging from $16.50 to $16.75 at the furnace or $17.25 to $17.50, Pittsburg. The total sales of Bessemer amount to about 9,000 tons. Foundry irons have also slightly advanced in price and the furnaces are having no difficulty in securing $16.75, Pittsburg, for prompt shipments.

The importation of both billets and sheet bars from Germany continues, the latter now being offered at $28.50 per ton, New York, Philadelphia or Baltimore. We note the sale of 3,000 tons of sheet bars at this price an equivalent of about $31, Pittsburg. Domestic sheet bars are held at $33 to $33.50 per ton and can only be had in small lots at this price. Bessemer billets are being offered in this market on a basis of $28 per ton, at mill, Johnstown, Wheeling or Youngstown, making the Pittsburg delivered price almost $29 per ton. Open-hearth billets are offered at $29 per ton Johnstown, or $29.85, Pittsburg.

The sheet bar situation, so far as the majority of the independent mills is concerned, is critical and something will shortly be done by the sheet manufacturers to provide for a steady supply of raw material. A meeting of the independent sheet manufacturers of the country will be held in this city on Monday, Feb. 3, for the purpose of forming an association. One of the matters to be discussed will be the sheet bar situation and an effort will be made by concerted action to relieve the strained condition of affairs. There has been some talk of a steel plant to be erected by the sheet manufacturers to provide their raw material, but it is highly improbable that this will be done as long as raw material can be secured from other sources. The meeting may result in the heavy importation of sheet bars from Germany until the domestic market is relieved. In addition matters pertaining to the selling side of the trade are to be discussed and an effort will be made to formulate an agreement.

In finished lines the market continues strong and a large amount of new business for forward delivery is being closed daily.

The structural mills continue to close large orders for delivery throughout the summer and have more orders booked at present than at any previous time in the history of the trade. Locally three new bridges are to be built, bids for which will be opened shortly. The Wabash railroad will also open bids for the erection of a bridge over the Ohio river at Mingo Junction within a few weeks. The erection of a large hotel by Henry C. Frick and a large warehouse on the Point will also take a large tonnage of structural material and it is

estimated that no less than 25,000 tons will be required to complete all the work referred to herein. The plate market while not flourishing is in a healthy condition, all the mills continuing in full operation with several weeks' business before them. The steel bar market shows increased strength, while an advance in iron bars is looked for by the trade very shortly.

The freight situation has grown much better in the last ten days and the mills are not only securing enough cars to move their daily output, but the accumulated stocks are being rapidly cut down and it is believed that within a few weeks they will disappear.

PIG IRON.—Sales of Bessemer iron during the week in various sized lots amount to about 9,000 tons. On several large orders for delivery to July 1, $16.75, Pittsburg, was secured, while smaller lots for prompt shipment sold as high as $17.25 to $17.50 per ton. The market is growing stronger daily and further advances are looked for. Sales of foundry iron amounting to about 7,000 tons have been reported. For delivery during the third quarter $16.25 is being quoted for No. 2, while small sales for prompt shipment have been made at $16.75 per ton. There is practically no Northern basic to be had. The last sales were made last week in small lots at $17 per ton, Pittsburg. The purchase is reported of about 10,000 tons of basic from Southern furnaces at $17.15, Pittsburg. Forge iron is quoted $16.25 per ton for prompt delivery, while $16 per ton is named on contracts for delivery the second quarter. We note the sale of 500 tons of forge for delivery through February at $16.25. During the week the last of the Carrie group of furnaces was blown in, thus largely increasing the daily output of iron from this plant. A new furnace for the production of foundry iron is also to be built near Dubois, Pa. Julian Kennedy is consulting engineer. Owing to the better supply of coke the furnaces are operating steadily and none were compelled to bank during the week. A number of furnaces in the Valleys, however, that have been out for relining and have been ready to blow in for a month or more have as yet been unable to secure a proper supply of coke to insure operation. We revise quotations as follows:

Bessemer, Valley	$16 00 to 16 75
Bessemer, Pittsburg	16 75 to 17 50
No. 1 Foundry	17 00 to 17 25
No. 2 Foundry	16 25 to 16 75
No 3 Foundry	15 75 to 16 25
Gray Forge, Pittsburg	16 00 to 16 50
Chilled Basic, Valley	16 00 to 16 25
Chilled Basic, Pittsburg	16 75 to 17 00

STEEL.—There have been further advances in both Bessemer and open-hearth billets during the week. Mills at Youngstown, Wheeling and Johnstown, Pa., are quoting $28 per ton for Bessemer, while the Johnstown, Pa., quotation is $29 per ton for open-hearth billets. The Pittsburg price for Bessemer billets is $28.90, while open-hearth billets are $1 a ton higher at the same place. As the price of domestic billets continues to advance the incentive to purchase German billets which are being freely offered is greater and the sale of 1,000 tons of billets for delivery west of Pittsburg is reported. The sale of 3,000 tons of German sheet bars at $28.50, Baltimore, is also reported for delivery to one of the Eastern sheet mills. Domestic sheet bars are held at $33 to $33.75 per ton, Pittsburg. Wire rods continue very firm. We note the sale of one 2,000 ton lot at $34.50 per ton for delivery within the next three months and one lot of 1,000 tons at $34.75, Pittsburg.

FERRO-MANGANESE.—Domestic manganese, 80 per cent, is held at $52.50 per ton delivered at buyer's mill in carload lots.

SPELTER.—Prime Western grades are held at 4.25c to 4.30c, Pittsburg. The market continues strong and a good local demand exists.

MUCK BAR.—Muck iron continues exceedingly firm and we note the sale of 1,000 tons for future delivery at $30 per ton.

SKELP.—The skelp market is firm with no change in prices. We quote grooved and sheared iron skelp at 1.80c to 1.85c and steel skelp at 1.75c.

RAILS AND TRACK MATERIAL.—The Mexican rail order has been divided among English and Belgian mills. The order called for 105,000 tons of which the Belgian mills secured 53,000 tons and the English mills the remainder. All the rail mills in this country continue to operate in full and on new business that is being closed deliveries are not promised before next November. Prices are unchanged as follows: Standard sections, 50 pounds and over, in lots of 200 tons and over, $28; car lots and less than 200 tons, $30; less than car lots, $32; light rails, 8 pounds, $42; 12 pounds, $38; 16 pounds, $35; 20 pounds, $34; 25 to 40 pounds, $32. Track material: Spikes, 1.95c to 2c; track bolts, square heads, 2.40c; hexagon heads, 2.55c; fish plates, 1.50c to 1.60c.

PLATES.—The plate market continues fairly strong, all the mills being comfortably fixed for several weeks. The consumption of plates by the plants of the Pressed Steel Car Co. will be enormous this year, as the orders now on the books of the company will keep all plants in full operation until next November. Prices remain unchanged as follows: Tank plate, ¼-inch thick and up to 100 inches in width, 1.60c at mill, Pittsburg; flange and boiler steel, 1.70c; marine, ordinary firebox, A. B. M. A. specifications, 1.80c; still bottom steel, 1.80c; locomotive firebox, not less than 2.10c; and it ranges in price to 3c. Plates more than 100 inches wide, 5 cents extra 100 pounds. Plates 3-16 of an inch in thickness, $2 extra; gauges Nos. 7 and 8, $3 extra; No. 9, $5 extra. These quotations are based on carload lots, with 5 cents extra a hundred pounds for less than carload lots. Terms, net cash in 30 days.

PIPES AND TUBES.—An advance averaging about 10 per cent has been made in the price of seamless tubing by the Shelby Steel Co. The amount of business now on the books of this company will keep its plants in full operation for three months. Merchant pipe and casing continues in good demand for this season of the year. The National Tube Co. continues to close a large portion of the business that is being offered despite the fact that a number of independent producers are making concessions. Discounts to consumers, Pittsburg, are as follows:

MERCHANT PIPE.

	Blk. Per cent.	Galvd. Per cent.
⅛ to ⅜ and 11 to 12 inches	61	48
½ to 10 inches	68½	56

BOILER TUBES.

Steel.

	Per cent.
1 to 1¼ inches	47½
2¼ to 5 inches	65½
1¾ to 2¼ and 6 to 13 inches	60

Iron.

	Per cent.
1 to 1¼ and 2¼ inches	43½
1¾ to 2¼ inches	43
2¾ to 13 inches	53

CASING.

	S. and S. Per cent
2 to 3 inches	58
3¼ to 4 inches	63
4¼ to 12¾ inches	65

BARS.—The steel bar market continues to rule strong and considerable new business is being placed for delivery throughout the first half of the year. Iron bars have been advanced $2 a ton by one interest. We make the following quotations: Common iron bars, 1.50c to 1.60c, Pittsburg; refined iron bars, 1.75c and upwards; Bessemer steel bars, 1.50c; open-hearth, 1.60c; plow beams and cultivator beams, 1.50c, net; channels, angles, zees and tees, Bessemer under three inches, 1.60c; over 3 inches, 1.70c. Hoops and bands are quoted at 1.90c, full extras.

SHEETS.—While the independent manufacturers of sheets are meeting the prices of the American Sheet Steel Co. no shading of prices is reported except on galvanized sheets. The market continues to rule firm especially on the heavier gauges. Quotations to consumers are as follows: Nos. 10 and 12, 2.40c to 2.50c; 14 and 15, 2.50c to 2.60c; 16, 2.60c; 18 and 20, 2.70c to 2.80c; 22 and 24, 2.80c to 2.90c; 26, 2.90c to 3c; 27, 3c to 3.10c; 28, 3.10c to 3.20c; 29, 3.25c to 3.35c; 30, 3.35c to 3.45c. Galvanized sheets are quoted at 70 and 5 and 75 off in carload lots; less than carload lots, 70 and 70 and 5 off.

STRUCTURAL MATERIAL.—Three bridges are to be built by the city of Pittsburg during the year. These together with other bridges and the buildings projected during the week will require about 25,000 tons of structural material. The market continues firm at unchanged prices. We make the following quotations: Beams and channels, 3 to 15 inches, 1.60c; 18 to 24 inches, 1.70c; tees, 1.65c; zees, 1.60c; angles

from 3 to 6 inches, 1.60c; universal mill plates, 1.60c.

WIRE AND WIRE NAILS.—Another meeting of the independent wire and wire nail manufacturers will be held within about ten days in Chicago for the purpose of perfecting their price agreement. We make the following quotations: Wire nails, $2.05 to large jobbers, $2.10 in carload lots and $2.15 in less than carload lots; plain wire to jobbers in carload lots, $1.95; $2 in less than carload lots; $2.05 to retailers, base, with the usual advances for sizes and galvanizing. Painted barb wire, $2.60 in carload lots to jobbers, and $2.70 to retailers; galvanized barb wire, $2.85 to $2.90 in carload lots to jobbers, and $3 to retailers. Cut nails are sold at $2.05, Pittsburg, in carload lots, and $2.10 to $2.15 in less than carload lots, 2 per cent off in 10 days.

MERCHANT STEEL.—The Crucible Steel Co. of America has orders on its books that will keep its plants in full operation for the next six months. The situation is very strong. The Colonial Steel Co., which will be the most formidable competitor of the Crucible Steel Co. of America, will place its plant in operation within about two weeks. We make the following quotations: Shafting, turned, cold rolled and round, 60 per cent off in carload lots and 55 off in less than carload lots; tire steel, 1.70c in carload lots and 1.80c in less than carload lots; toe calk, 1.90c to 2c; sleigh shoes, 2c to 2.25c; machinery steel, 1.50c; smooth machinery steel, 1.75c. Tool steel, 7 cents and upwards.

OLD MATERIAL.—We note the sale of 1,000 tons of wrought scrap at $17.25 per ton, net. Also the sale of 1,000 tons of heavy melting stock at $17.25 per ton gross. We revise quotations, gross tons, as follows: Heavy melting stock, $17.25 to $17.50; steel rails, $17 to $17.25; busheling scrap, $13.50 to $14; No. 1 wrought, $17.25 to $17.50; iron rails, $22 to $23; cast borings, $8.50 to $8.75; cast scrap, $15.50 to $15.75.

COKE.—For the week ending Saturday, Jan. 11, the total estimated output of the Connellsville region amounted to 206,545 tons, which was several thousand tons less than the production of the previous week. The shipments were more than 1,200 cars greater than those of the week previous, however. Connellsville furnace coke is held at $2.25 per ton and foundry at $2.75. Outside coke is about 25 cents per ton less than the above quotations.

CHICAGO.

OFFICE OF *The Iron Trade Review*,
934 MONADNOCK BLOCK, Jan. 21

There has been heavy buying of material in all lines in the past week, and the prospects are that the output of mills and furnaces for the next six months will fall considerably below the demand. Owing to the impossibility of buyers to secure material within a reasonable delivery, there is a marked tendency to increase values on certain products. This is particularly true as applied to pig iron, bar iron and steel, track supplies, light sections of structural steel, merchant steel and wire products. Nearly all manufacturers of these materials have sold their entire capacity for periods varying from three to six months, and are daily offered large premiums for such shipments within this period as they can give. The transportation problem is gradually solving itself, and a decided improvement is noted in the fuel supply. A number of local furnaces were blown in last week, among them being three of the Illinois Steel Co. No. 9, at South Chicago, No. 1 at Bay View, and No. 4 at the Union Works, Chicago. These furnaces make Bessemer iron, with a total output of about 900 tons a day, all of which is consumed by the company. About six furnaces are still out of blast, however, for want of fuel. The buying of pig iron in the past week includes many large orders, most of which call for delivery in the third quarter. Spot iron, which is extremely difficult to get, commands a premium of $1 to $2 a ton. Bar iron for prompt shipment is 50 cents to $2 a ton above quotations, and on long time contracts is commonly sold at 1.75c. Steel angles for 60 to 90 days' delivery are commanding a premium of $2 to $3 a ton, and at these prices it is hard to get material. The local offices of Central Western structural steel mills report they have withdrawn from the market on light sections of beams, channels and angles, being unable to furnish material for the next six months, and the local manufacturer of wire products states that it is quite behind with orders. In all lines consumers are specifying heavily, and in many cases are exceeding their contracts.

PIG IRON.—The most pronounced feature in the local situation is the improvement in the fuel supply, which has resulted in the blowing in of a number of the idle furnaces in this district. The past week has been an excellent one in point of tonnage sold, orders ranging from carload lots to 5,000 tons, the majority of which is for delivery in the third quarter. There is a heavy demand for spot iron, which commands a premium of $1 to $2 a ton above regular quotations. Southern furnaces are taking most of this business. Charcoal iron and gray forge is also in good demand, owing to the scarcity of other grades. We quote prices as follows:

Lake Sup. Charcoal	$19 25 to $19 75	Southern No. 1 Soft	$16 15 to 16 40
Local Coke Fdy. No. 1	16 00 to 16 50	Southern No. 2 Soft	15 55 to 15 90
Local Coke Fdy. No. 2	15 50 to 16 00	Southern Gray Forge	14 65 to 14 90
Local Coke Fdy. No. 3	15 00 to 15 50	Southern Silveries	16 65 to 17 65
Local Scotch Fdy. No. 1	16 00 to 16 50	Jackson Co. Silveries	17 00 to 17 50
Local Scotch Fdy. No. 2	15 50 to 16 00	Ohio Strong Softeners	17 50 to 18 00
Southern Coke No. 1	16 40 to 16 65	Alabama Car Wheel	20 50 to 21 00
Southern Coke No. 2	15 65 to 15 90	Malleable Bessemer	16 50 to 17 00
Southern Coke No. 3	15 15 to 15 40	Coke Bessemer	18 00 to 18 50
Southern Coke No. 4	14 65 to $14 90		

BARS.—Notwithstanding the effort on the part of mills to keep prices to their present level, it is quite possible they will be forced to make an advance in the near future, owing to the exceedingly heavy demand for material. Most of the producers in this market are sold up for three to six months on both iron and steel, and buyers are freely offering premiums to secure prompt delivery. On long time contracts for iron, some mills are getting 1.75c, and for quick shipment, 50 cents to $2 above quotations. Steel angles for 60 to 90 days delivery, command a premium of $2 to $3 a ton, and other shapes and sizes a like proportionate increase. A heavy tonnage in both materials has been booked in the past week, many consumers having been forced to largely increase their contracts. Specifications have also been heavy, and mills are taxed to the utmost limit to ship material. No advance having been announced, we continue to quote iron and steel at 1.65c Chicago; out of store, 1.90c to 2c.

SHEETS.—Mills report that orders are plentiful, and that they are still some months behind in deliveries. Jobbers also report that buying keeps up to past proportions. We quote No. 27 black from dealers, 3.45c, and galvanized 70 per cent to 70 and 5 per cent.

STRUCTURAL STEEL.—An Eastern mill has secured contract for 1,400 tons of steel from the McCormick Harvesting Machine Co. for the new malleable iron foundry which this company is building. Between 5,000 and 6,000 tons of material will be required in all. The local offices of Pittsburg mills report they have withdrawn from the market on light sections of beams, channels and angles, having sold all the material they can manufacture for the next six months. There is plenty of business offered, and the indications are that building in this section will be heavy all through the year. We quote mill shipments, carload lots, as follows: Beams, 15 inches and under, 1.75c; 18 inches and over, 1.85c; angles, 6x6 and under, 1.75c; over 6x6, 1.85c; plates, 1.75c, base; tees, 1.80c; zees, 1.75c; lots from store, 2¼c to 3 cents per pound.

RAILS AND TRACK SUPPLIES.—There is nothing new to be reported in the rail situation. A correct report would be a mere repetition of what we have stated for the past few weeks. There is a heavy demand for all kinds of track supplies, and the local interest reports that on railroad spikes, it is out of the market for six months, on light tee rails, three months and on track bolts, four months. We quote as follows: Standard rails, $28; light sections, $34 to $36, according to size; out of store, $40 to $44; splice bars, 1.70c to 1.80c; spikes, 1.95 to 2.05c; track bolts and hexagon nuts, 2.80c to 2.90c, out of store, 2.90c to 3c; square nuts, base, 2.65c to 2.75c; out of store, 2.75c to 2.85c.

MERCHANT STEEL.—This is the busy season for the implement manufacturing trade and mills, instead of seeking new business, are kept busy furnishing material on orders placed months ago. Specifications against contracts are very heavy at the present time, and could the material be obtained, many manufacturers would largely exceed their contracts. We quote mill shipments, Chicago delivery, as follows: Smooth finished tire steel, 1.85c to 2c; open hearth spring steel, 2.25c to 2.50c; sleigh shoe, 1.65c to 1.80c, flat sizes; concave and convex, 2c; cutter shoe, 2.40c to 2.60c; machinery steel, 2.15 to 2.25c, base; plow steel, 2.50c and upwards, according to quality; toe calk,

2.40c to 2.60c; on large orders, the latter price can be shaded slightly; ordinary tool steel, 6c to 7c; specials, 13c and upwards; less than carload lots, 5 per cent to 10 per cent higher.

BILLETS.—On account of the crowded condition of mills, sales are limited to small lots, at full prices and without promise of delivery. We quote Bessemer billets, $31 to $33; open hearth, $33 to $35.

PLATES.—There is a steady supply of small orders, and the local mill has sufficient business on its books to keep it in operation from four to six weeks. The demand from store is fairly active. Our quotations follow: Tank steel, base, ¼-inch, 1.75c to 1.85c; flange steel, 1.90c to 2c; marine steel, 1.95c to 2.10c; firebox steel, ordinary, 2c to 2.10c; special, 2.25c and upwards. Jobbers are selling from store according to size, as follows: Tank steel, 1.90c to 2c; flange steel, 2.10c to 2.25c; marine steel, 2.40c to 2.50c; firebox steel, ordinary, 2.40c to 2.50c; special, 2.50c and upwards.

CAST IRON PIPE.—The extremely mild weather that has been prevailing in the West for several days, has brought forward many inquiries. A large tonnage has not been booked, though the indications point to a buying movement in the near future. We quote as follows: 4-inch water pipe, $29; carload lots, f. o. b. Chicago; 6-inch water pipe, $28; 8-inch and larger sizes, $27; gas pipe, $1 per ton higher than above prices.

MERCHANT PIPE.—Mills report that the volume of business is good, and that they are catching up on delayed deliveries. Our quotations, which are unchanged, follow:

MERCHANT PIPE, RANDOM LENGTHS.

	Black Per cent.	Galv. Per cent.
⅛ to ⅜ and 11 to 12 in	59.5	46.5
¼ to 10 inches	67	54.5

BOILER TUBES.

	Steel Per cent.	Iron Per Cent.
1 to 1¼ in	40	35
1¼ to 2¼ in	47½	37½
2¾ to 5 in	57½	47½
6 in. and larger	45	40

WIRE AND WIRE NAILS.—There is no appreciable change from the condition of a week ago. The leading local interest is literally engulfed with orders, the spring-like weather that has prevailed in the West for the past two weeks having greatly augmented the demand. As a result of the advance decided upon at Pittsburg last week, quotations to jobbers are as follows: Painted barb wire, carload lots, $2.70; galvanized barb wire, in carload lots, $3; wire nails, carload lots, $2.15; jobbers' prices to retailers, 10 cents higher than above quotations.

COKE.—The receipts of coke last week were somewhat heavier than for many weeks previous, and there is in consequence a more optimistic feeling prevalent. The present supply, however, is far from adequate. For immediate shipment, $6 is easily secured; on long time contracts, $5 to $5.25.

OLD MATERIAL.—There is a better tone to the market all round, and some consumers have bought heavily in the past week. Owing to the heavy demand from foundries prices are firmly maintained. The following are approximate prices in gross tons:

Old iron rails	$21 00 to $21 50	Relaying rails	27 00 to 28 00
Old steel rails, 5 ft. and up	21 00 to 21 50	Old wheels	$16 50 to $17 00
Old steel rails, mixed	14 00 to 15 00	Heavy melting steel	14 00 to 14 50
		Mixed country steel	10 50 to 11 00

The following are selling prices per net ton:

No. 1 R. R. wrought	$15 00 to $15 50	Steel Axles	$18 50 to $19 00
No. 2 R. R. wrought	13 25 to 13 75	Cast borings	5 25 to 5 75
Dealers' forge	13 00 to 13 50	Wrought turnings	10 00 to 10 50
No. 1 busheling	11 00 to 11 50	Iron axle turnings	12 00 to 12 50
No. 1 R. R. & mach. cst.	11 75 to 12 25	Steel axle turnings	11 00 to 11 50
Railway malleable	12 00 to 12 50	Stove plates	8 50 to 9 00
Country malleable	11 50 to 12 00	Old iron splice bars	16 50 to 17 00
Iron axles	21 00 to 21 50		

CLEVELAND

OFFICE OF *The Iron Trade Review*, 1064 ROSE BUILDING, Jan. 22.

A meeting of producers of Lake Superior Bessemer ores is in session today—the first formal meeting on the situation for 1902, though there have been some preliminary committee meetings and informal conferences. The announcement of prices of old-range Bessemer ores, which it is understood will be on the $4.25 basis of 1901, is expected within the coming week. Further consideration has been given in the past week to the proposal for an advance in the price of Mesabi Bessemer ores and for an agreement on old-range non-Bessemers. These questions were expected to have attention also in today's meeting. The matter of tonnage is a difficult one in connection with the Mesabi situation, particularly in view of the large sales that have been made on 10-year contracts. The chances are favorable for a somewhat higher price for the best Mesabi ores—probably $3.25, as against $2.75 to $3 last year. For standard non-Bessemer soft ores of the old ranges the basis is expected to be in the neighborhood of $3.25. No sales have been made for some time and it is expected that all ores will remain withdrawn from the market until definite announcement concerning pending matters is made. Nothing is being done about vessel contracts. Owners talk of better rates for 1902, but the probabilities point to the same basis for season contracts as in 1901.

PIG IRON.—The furnaces in the Valleys are faring much better in the matter of coke supply, but it will be some weeks before shipments on contracts can be overtaken. Selling of foundry grades is better in Southern than in Northern irons, but the chief thing with consumers is to get iron now needed. Forge iron has continued strong and a large wrought pipe interest has been a buyer. We quote $15.50 at Valley furnace, spot delivery being $15.75, with very little to be had. The Bessemer market is quiet at $16 Valley furnace, though a few lots for early shipment are said to have brought $16.25. Basic iron is quoted $15.75 to $16 at Valley furnace and Bessemer at $16, while as high as $16.25 and even $16.50 at furnace, equivalent to $17 and $17.25, Pittsburg, has been paid for quick delivery. The market is very firm on all irons. We quote f. o. b. Cleveland as follows:

Bessemer	$16 50 to $17 00	Scotch No. 1	$16 50 to $17 00
No. 1 Strong F'dry	16 50 to 17 00	Scotch No. 2	16 25 to 16 75
No. 2 Strong F'dry	16 25 to 16 75	Gray forge, Valley	15 50 to 15 75
No. 3 Foundry	15 75 to 16 00	LakeSuperior charc'l	18 00 to 19 00

FINISHED MATERIAL.—In spite of the fact that shipyards have contracts in hand which it has been supposed would keep them fully occupied until late in the summer of 1902, there are more plans for new vessels under consideration and inquiries are out for 17,000 tons of material—10,000 tons of plates, 5,000 tons of shapes and 2,000 tons of bars. There is some buying of boiler steel, but no large orders, boiler manufacturers being covered on running contracts. Fairly prompt deliveries of all grades of plates are being made. We continue to quote 1.70c, Cleveland, on mill shipments. An advance of $2 a ton in bar iron to 1.60c, Pittsburg, was announced on Tuesday by one large producer. Another interest has withdrawn quotations indicating that an advance is pending. The advance already announced is a surprise. Its effect will naturally be to turn tonnage to steel. This might be agreeable to some producers, but not equally so to others. There has been considerable buying of bar iron by local bolt and nut works, and mills are all well employed. On Bessemer steel bars we quote 1.58½c Cleveland on mill shipments; on bar iron, 1.63½c to 1.68½c. Sales of bar iron out of stock are made at 1.75c to 1.80c, Cleveland. The structural mills are rapidly filling up with business and there is already a feeling that the spring demand will bring a greater tonnage than can be handled. We continue to quote 1.70c, Cleveland, for mill shipments of beams and channels up to 15 inches. On orders out of stock, Cleveland prices range from 2½c to 2¾c. The indications are that the business of furnishing shapes cut to length from stock will be more of a factor the coming season than heretofore. The sheet market reflects the easing up of the situation as to deliveries. Demand continues good even with the increase in sources of supply. Mill shipments to consumers are quoted as follows, f. o. b. Cleveland: No. 24, 2.90c to 3c; No. 26, 3c to 3.10c; No. 27, 3.10c to 3.20c, with usual extras for less than carload lots, etc. Round-lot quotations from store are as follows: No. 10, 2.35c to 2.50c; No. 12, 2.45c to 2.60c; No. 14, 2.55c to 2.70c; No. 16, 2.95c to 3.10c; No 18, 3c to 3.15c; No. 20, 3.05c to 3.20c; Nos. 22-24, 3.15c to 3.30c; Nos. 25-26, 3.25c to 3.40c; No. 27, 3.35c to 3.50c; No. 28, 3.45c to 3.60c. The above are for one pass through cold rolls. For full cold rolled the extra is .10c. Galvanized sheets are quoted 70 to 70 and 5 off list.

OLD MATERIAL.—The market is very firm and some dealers are sufficiently sanguine to predict an advance in prices in the near future. At the present time prices remain practically at the level of last week. We quote the Cleveland market as follows, all in gross tons:

Old steel rails, rolling mill lengths	$17 00 to 18 00
Old steel rails, short lengths	15 75 to 16 50
Iron rails	21 00 to 22 00
No. 1. railroad wrought	16 50 to 17 50
Mill scrap	14 50 to 15 00
No. 1. machine scrap	14 00 to 14 50
Machine shop turnings	12 50 to 13 00
Cast borings	6 50 to 7 00
Grate bars	8 50 to 9 00
Sheet iron	9 00 to 10 00
Stove plate	10 00 to 10 50
Car wheels	15 50 to 16 50

CINCINNATI.

Jan. 21.

Notwithstanding it has been thought that the first half of the year and well into the second half were covered by pig iron buyers there has been a continued good buying of iron during the past week and orders in the mails this morning show about the same aggregate for the past few months. Buying goes right ahead also in other branches of the iron trade, notably in the market for finished material. The advance made last week in the price of bars has had no effect in the demand, manufacturers needing such material apparently paying no attention to it. With manufacturers of machine tools and specialties and all iron products the trade is very good and most of the factories are still far behind their orders.

There is some relief in the car situation. The furnaces are able to get coke more easily; shipments of iron are more prompt; furnaces are starting up or have started up where they were banked some time ago, and generally it is easier to do business. Nevertheless there is in no direction a hint that the market for pig iron is any easier. On the other hand it is the general belief that the market price of iron will not advance farther at least for quite a while.

Foundrymen are rather encouraged at the outlook. They have before them in prospect a good year's business, iron contracted for in many instances under the high prices, and deliveries are getting better. They have had some trouble in getting molders, but that is less bothersome than it has been.

Pig Iron.—The demand is such as to indicate that before the end of the first quarter practically the bulk of the production of the furnaces for the year will be placed. It has been so largely placed now that it is but a step to being quite placed in full. There have been no changes in the prices of any grade of iron, but all have held firm. There has been rather heavy buying of basic during the past week, one order having been given for 7,000 tons, another for 5,000 and a third for 3,000 in the past few days. The lower grades of foundry iron are practically impossible to get hold of for anything like early delivery. It is rather pleasing than otherwise, however, to the furnacemen that the demand for the foundry grades under No. 2 is not quite so pressing. Indeed, furnacemen indicate that they would welcome something of a lull. Prices remain unchanged at Cincinnati as follows :

Southern Fdy. No. 1	$15 25 to $15 50	Gray Forge	$13 75 to $14 00
" " 2	14 75 to 15 00	Northern Fdy. No. 1	17 10 to 17 35
" " 3	14 25 to 14 50	" " 2	16 60 to 16 85
" " 4	13 75 to 14 00	Southern C.W. iron	18 75 to 19 25
So. Fdy. No. 1 soft	15 25 to 15 50	Malleable coke iron	16 60 to 16 85
So Fdy. No. 2 soft	14 75 to 15 00		

Finished Material.—The advance in iron and steel bars which was made here last week has become general with the mills, and there has been no decrease in the business noticeable. The local association of iron dealers has not as yet advanced the price of bars out of store, but it is expected that a meeting will be held during the week, when this will be done. Manufacturers are buying liberally. Deliveries are slightly better on some kinds, heavy plates being obtainable now in ten days or two weeks. Iron and steel bars are to be had in reasonable time, the better deliveries being made on iron bars. With light plates and sheets and with all other kinds there is a good deal of complaining still over the slow deliveries. Sheets cannot be had under eight or nine weeks. Architectural iron handlers and manufacturers are unable to meet the demand and when building opens up it is not likely that there will be any relief afforded the complaints of those wanting to do construction work. Prices on iron bars are 1.70c at Cincinnati and on steel bars, 1.72c. The price of both iron and steel bars out of store remain at 1.90c where they were when the advance was made by the mills. It is likely that the store prices will be advanced to 2c for both iron and steel bars out of store.

Old Material.—The demand for scrap has been good during the week. Consumers have been taking a good deal of steel scrap on account of the trouble in getting billets, and then the fact that the prices on scrap remain at just about the same figures makes the old material inviting. The past week quite an important purchase of old iron rails was made by the Chicago branch of the Block-Pollak Iron Co., of Cincinnati. The company bought the Mississippi & Little Rock Railroad at Master Commissioner's sale at Little Rock. It is 27½ miles long and there is about 3,000 tons of rails in the road, for which the company paid $20,100. Prices on scrap remain firm and unchanged, the following ruling at Cincinnati :

Old No. 1 Wrought Railroad, net tons	$ 15 50 to 16 00
Cast Machine and Foundry, net tons	12 50 to 12 75
Old Iron Rails, gross tons	21 25 to 21 50
Old Steel Rails, gross tons	18 00 to 18 25
Old Short Lengths, gross tons	15 00 to 15 25
Old Iron Axles, gross tons	21 00 to 21 50
Old Iron Car Wheels, gross tons	16 00 to 16 25
Stove Plates, gross tons	9 75 to 10 00
Wrought Turnings, net tons	11 50 to 11 75
Cast Borings, net tons	5 50 to 6 00

PHILADELPHIA.

Jan. 21.

The exceptional strength of the market has shown itself in further advances during the week, although foundry irons have not kept pace with other grades of iron, except where immediate needs were involved, when prices paid can hardly be said to be a criterion of the general market. The peculiar conditions surrounding the iron and steel situation make it impossible to judge the future with any degree of certainty. All know, however, that iron is a scarce commodity and that while prices are irregular they show a tendency towards a higher level.

Pig Iron.—Those who are fortunate enough to have iron at their disposal for prompt shipment are naming their own figures, yet nearly every transaction of this kind is influenced by personal considerations and exact figures are unobtainable. For future deliveries sellers are disposed to offer more attractive quotations, but even these show no uniformity. The general sentiment that values are high enough may have to give way should demand increase much more. Material improvement in the coke and car situation would tend to clear up many uncertainties and give greater stability to the market in general. As near as can be ascertained the range of prices for Philadelphia and nearby points are about as follows : No. 1 X foundry, $18 to $18.50; No. 2 X foundry, $16.75 to $17.50; No. 2 plain, $16 to $16.50; standard gray forge, $15.75 to $16.25; ordinary gray forge, $15 to $15.50; basic (chilled), $16 to $16.50.

Finished Material.—A fair demand exists for nearly all forms of finished material, structural shapes being most active. The plate mills are having nearly all the work desired to keep running comfortably, with excellent prospects for the summer months. An occasional complaint of dullness is heard from bar mills, but prices are firmly maintained. For city and seabord deliveries prices are as follows : Plates, ¼-inch and thicker, 1.75c to 1.80c; bars, iron or steel, 1.62½c to 1.70c; angles, 1.75c to 1.85c; beams and channels, 1.75c to 1.85c.

Old Material.—The market is showing considerable strength and full prices are being realized, especially for steel melting stock. The iron mills appear a bit backward about placing orders, and rumor has it that the effort to establish a central purchasing agency is to be renewed. Bids and offers for deliveries in buyer's yards are about as follows : Choice railroad scrap, $20 to $20.50; No. 2 light scrap, $12.75 to $13; machinery cast, $14.50 to $15; heavy steel, $18.25 to $18.75; old iron rails, $21 to $22; wrought turnings, $13 to $13.50; cast borings, $8.25 to $8.50; old car wheels, $17 to $17.25; old iron axles, $24 to $25; old steel axles, $20 to $21.

The partnership existing between Arthur W. Howe and George T. Johnson, trading as Howe, Johnson & Co., at 719 Drexel building, Philadelphia, was dissolved Jan. 1, Arthur W. Howe retiring. The business in pig iron, coal and coke will be continued at the same place by the remaining partner under the firm name of George T. Johnson & Co.

It is reported on reliable authority that the Lackawanna Iron & Steel Co. will increase its capitalization from $20,000,000 to $40,000,000.

THE IRON TRADE REVIEW

Devoted to the Machinery, Metal-Working and Foundry Trades, and Iron and Steel Manufacture.

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ENTERED AT THE POST OFFICE AT CLEVELAND, O., AS SECOND CLASS MATTER

JANUARY 23, 1902.

The index to Volume XXXIV of *The Iron Trade Review,* taking in the 52 issues of 1901, is now ready and will be mailed to subscribers who desire it.

STEEL RAIL PRICES AND THE TARIFF.

In commenting on the earnings of the United States Steel Corporation, the Pittsburg *Post* says: "The American people contribute liberally to the splendid figures of the steel trust, but they do it in a way that is not altogether fair. The steel trust, for example, is now selling American rails in England for $22.50 per ton, after paying the ocean and railroad freights." Then follows some of the usual free trade computation about the amount of money the American rail buyers are losing through the tariff on rails. It ought to be known by this time that American rail mills—and only half of them are in the "steel trust"—are not exporting any rails. The Associated Press is authority for the statement that a Mexican railroad has just bought rails from Belgium at a price about $10 less than the lowest American bid. It seems to be overlooked in some of the comments on this transaction that if the Belgians underbid American mills $10 a ton in Mexico, they can underbid them still more in England.

It is at a time just like the present that an iron and steel tariff schedule is needed. A few years ago it did not seem to be needed, but the protection literature of that period will show many predictions that the time might come when the United States would be in a very prosperous condition and foreign markets would be depressed, and it was argued that then the tariff would be needed. The predicted conditions are being realized. Some steel is even being imported with the tariff as it is, and these imports are likely to increase in the near future. It would be very hard to show how any possible benefit could accrue at this time by throwing our splendid domestic market open to the products of the German iron syndicates, which to-day are in a miserable condition.

It is true that a liberal profit is made by the rail mills of the United States on the $28 price, but we know of no interests so well able to pay such a price as the railroads of the country, with their magnificent earnings of the past two years. In 1897 they bought rails at $17 and $18, and the transactions advertised to the world the poverty-stricken condition of both railroads and steel works. It is strange that newspapers which in the intervals of tariff denunciation find diversion in making war on railroad monopolies should be so strongly moved by the price these same railroads pay for their rails in the heyday of their prosperity.

AMERICAN METHODS IN BRITISH WORKS.

There are signs that American ideas are finding some lodgment in the British iron industry. Following the recent announcement that an American firm of blast furnace engineers are to have charge of the rebuilding of certain British stacks, and the building of several new ones, we find this statement in the London *Iron and Coal Trades Review* concerning the house-cleaning ordered at a well-known works:

> A very considerable amount of interest has been evoked by the changes that are going on at the Dowlais Iron and Steel Works, in South Wales. Those changes have involved getting rid of the services of a considerable number of men, both as foremen or "gaffers," and as working hands, who were employed in situations which, under the new regime, it has not been deemed necessary to keep open. The process has been a painful and disagreeable one, but it is, nevertheless, essential to the maintenance of that high standard of efficient and economical working which the present administration, borrowing many hints from the United States, has set before itself in reorganizing this important establishment. In many other directions improvements and economies are being carried out both at the old Dowlais Works and those at Cardiff. Messrs. Keen, Richards and Martin appear determined that, if it is possible to make good headway against foreign competition, it shall be done at Dowlais. Their example is stimulating, and it will probably be found that what can be done at Dowlais can and will be done at other British works. It is reported that the whole plant is to be modernized under the direction of an American engineer.

Gray-bearded foundrymen and managers at blast furnaces, superintendents at steel works and rolling mills, and foremen and superintendents in large machine shops, are familiar recollections of American visitors at British works. The fact that men have been in positions of responsibility at industrial works for twenty-five, thirty and even forty years, and have done things practically the same way during their entire incumbency, does not seem to occur to the directors of British manufacturing companies as sufficient cause for a change. The fact that dividends may have been made all the years of their connection with the industry is proof enough to them and to their directors that no change is needed. Instances might be cited in which some of these patriarchs have solemnly protested in directors' meetings against the discarding of old equipment, partly on the ground that it had done well for twenty years, and certainly what was good enough for the directorate of twenty years ago was good enough for that of to-day. We are told of a case in which a superintendent pleaded successfully against the recommendation of an American engineer for the retention of an engine that had been installed during the incumbency of his father, whom he had succeeded. The associations about that piece of machinery were too many to permit of its ruthless removal!

We do not claim that the case is typical; but there is a generalization that may fairly be made in this connection, and that is that to the average board of directors in Great Britain a record of dividend paying over a period of years is regarded as full justification for the retention of existing organization and equipment, though vast improvements on both may be found in competing countries. It is this aversion to change that more than anything else is responsible for the present plight of the British iron trade. Tangible fruit of this disastrous do-nothing policy is found in iron and steel importations to the British Isles, amounting to nearly $40,000,000 in 1901. It is not surprising that the contemporary from which we have quoted above is agitating with vigor such a modification of Great Britain's free trade policy as shall insure the home market to British iron and steeel manufacturers. We predict that no such change will be made, though forceful reasons are advanced in the article in question for some steps that shall aid in stopping the tide that is now running with increasing strength against British manufacturers of iron and steel.

The changes to be made at the Dowlais works are part of the progressive policy of three men who have better acquaintance than any other British steel manufacturers with the achievements of American steel works. They have given much time to the study of American methods, and they are evidently determined to follow them in some measure. It is yet to be seen what manner of fruit this American graft on the British tree will bear. And if the heroic policy of this trio of broad-minded steel masters succeeds it is still a question whether other British manufacturers will be led to copy it soon enough to save themselves.

Two mills of the sheet plant of the Cumberland Sheet & Steel Co., Cumberland, Md., were placed in operation last week. The 32-inch mill will be placed in operation shortly. The open-hearth furnace in the plant which has been enlarged to 20-tons capacity will be placed in operation about Feb. 15. The blooming mill will also be placed in operation about that time and the sheet bars required will be rolled from the steel made in the open-hearth furnace. The mills are equipped to roll sheets from 10 to 18 gauge. The five steam hammers in the plant will also be placed in operation shortly.

Marcus Hamilton, of Johnson City, Tenn., has filed a petition in the Federal Courts of Knoxville, Tenn., asking that the Virginia Iron, Coal & Coke Co., operating furnaces, coal and iron lands in Southwest Virginia and East Tennessee be declared bankrupt. It is alleged that the company has bonds outstanding in the sum of $9,975,000 at 5 per cent, and that it owes notes aggregating about $575,000 and has defaulted in payment of interest on the bonds. The company was organized in 1898 and has been in the hands of a receiver for some time.

The Fischer Foundry & Machine Co., South Side, Pittsburg, has purchased a piece of property adjoining its present plant 120x308 feet. The property will be used for making extensions to the foundry and machine shop operated by the company.

Furnace No. 1 of the Carrie plant of the Carnegie Steel Co. at Rankin, Pa., recently rebuilt was blown in last week. The capacity has been increased from about 450 tons daily to 700 tons. The furnace has the same dimensions as the other furnaces of this group. The blowing in of No. 1 puts the entire plant into operation and the daily output of this plant will hereafter range from 2,800 to 3,000 tons daily.

FOREIGN TOOL STEEL IN AMERICAN SHOPS.

To the Editor:

In your current number there is an article by an English machinist, comparing American and English shop methods and incidentally stating, "English steel makers seem to have nearly a monopoly of the American tool steel market. The Americans themselves admit that their steel is not so durable." This statement would be ridiculous if it were not apparently backed up by your editorial review of the article in which you say, "It is true that considerable of our tool steel is imported, etc."

Now, if there is any one article of which we should be justly proud, it is our tool steel. About 30 years ago when we first went into the axe business the English makers did monopolize this market, but a few years later, after thoroughly testing their steel against the American steel, we dropped the English steel for good. And today there is at least 6,000 tons of high grade crucible steel being consumed in this country for axes, hatchets, scythes and similar goods, every pound of which is American make and far superior for the purpose to any English crucible steel on the market. Further significance is added to this by the statement that the entire markets of the world, including the English colonies of Australia, South Africa, etc., are almost exclusively supplied by these American-made tools containing this American-made crucible steel. In our own machine shops here we find the American crucible steel machine tools the best on the market with the single exception of some Mushet self-hardening steel which is used in very limited quantities for some special work.

We are confident that other manufacturers could relate the same experience and the reputation of our American steel makers thereby be given its just due. KELLY AXE MFG. CO.,

J. P. Kelly, Vice-President.

Alexandria, Ind., Jan. 16.

[The editorial referred to was not intended to support the contention of the writer of the article and a careful reading of the paragraph does not disclose any lack of appreciation of the American product. On the contrary it is pointed out that American tool steel has been record-breaking when handled by native methods. It must not be forgotten that the article and the editorial referred exclusively to tool steel for machine shop purposes and it would be highly interesting to learn exactly the status of English tool steels as compared with the American product in our machine shops. To that end we have submitted some questions to interested concerns and their replies will be given in an early issue.—EDITOR.

New Car Orders Still of Large Volume.

The heavy car buying of the past six months seems to have no interruption. The *Railroad Gazette* in its last issue notes the following recent orders: Lake Shore & Michigan Southern, 1,000 box cars; Clarendon & Pittsford, 25 flat cars; Wheeling & Lake Erie, 500 freight cars; Shawmut (Pa.) Coal Co., 100 coal cars; Toledo & Ohio Central, 1,000 coal cars; Delaware, Lackawanna & Western, 200 box cars, Warren (Pa.) Refining Co., 25 tank cars; Algoma Central & Hudson Bay, 200 flat and 100 box cars; Belington, Beaver Creek, 500 coal cars; Norfolk & Western, 1,000 gondola cars; New York Central & Hudson River, 1,000 box cars and 1,000 coal cars; McCloud River, 60 flat cars; Cincinnati Southern, 1,800 box, coal and flat cars; Mather Stock Car Co., 100 freight cars; Atchison, Topeka & Santa Fe (previously reported in total), 1,500 stock, 1,500 box and 1,200 refrigerator cars; Hocking Valley, 3,000 coal cars; Pittsburg & Lake Erie, 1,000 box cars; Illinois Central, 500 ventilated fruit cars; Chicago, Milwaukee & St. Paul, 500 wooden carriage cars and 100 ore cars.

Edgar M. Moore, who was for some time purchasing agent for the Philadelphia Co. at Pittsburg and subsequently connected with the operations of the J. M. Guffey Petroleum Co. in Texas, has opened offices at 503 Liberty Ave., Pittsburg, under the firm name of Edgar M. Moore & Co. The firm will act in Pittsburg and vicinity as purchasing agents for non-resident buyers, especial attention being paid to the purchasing of iron and steel and machinery.

A METHOD OF HARDENING ARMOR PLATE.

Benton K. Jamison, Philadelphia, has recently taken out three patents for the manufacture and treatment of armor plates. The system consists in slowly heating a steel plate to a bright-red, then submerging it in a bath of hardening liquid, keeping it in the bath for a sufficient length of time to effect the hardening process and maintaining the bath as nearly as practicable at a temperature of about 60° to 70° Fahrenheit, and then toughening the face of the hardened portion in surface-tempering, whereby an armor-plate of three different grades of steel may be obtained. Another claim is less general and describes a mode of manufacturing in armor-faced plate hardened to any required depth, which consists in slowly heating a plate of low-grade or mild open-hearth steel containing from .20 to .50 per cent of carbon, and alloyed with from 1½ to 5 per cent of nickel, to a bright-red heat, submerging it when at this heat for a sufficient length of time to effect the hardening process in a bath of hardening liquid to a depth corresponding with the depth to which it is required to harden it, maintaining the bath during the process at as nearly as practicable a temperature of about 60° to 70° Fahrenheit by cooling it, annealing the back portion of the plate by placing upon the back of the plate when so heated, a plate heated to a greater heat, as a white heat, removing the plate from such bath, and then toughening the face of the hardened portion of the plate by surface-tempering.

The inventor in his other two patents claims the following solutions for the treatment of steel: Sweet spirits of niter, three ounces; aqua ammonia, three ounces; chloride of ammonium, six ounces; sulphate of zinc, three ounces; ground alum, three ounces; glycerin, eight ounces; water, one gallon. Or sweet spirits of niter, three ounces; aqua-ammonia, three ounces; chloride of ammonium, six ounces; sulphate of zinc, three ounces; ground alum, three ounces; glycerin, eight ounces; sulphate of copper, one ounce; nitrate of soda, one ounce; water, one gallon.

The method of preparing these solutions is described as follows in two of the claims: In mixing solutions for the treatment of steel containing ground alum, sulphate of zinc, water, glycerin and other ingredients; first introducing the alum and sulphate into the water, maintaining such mixture in a state of rest for approximately 12 hours, then adding the glycerin and other ingredients, and maintaining the solution in a state of rest for approximately 24 hours before using. The method of making a solution for the treatment of steel consists in first introducing three ounces of ground alum and three ounces of sulphate of zinc into one gallon of water, maintaining such mixture in a state of rest for approximately 12 hours, then adding glycerin, eight ounces; chloride of ammonium, six ounces; aqua-ammonia, three ounces; and sweet spirits of niter, three ounces.

Jones & Laughlins, Ltd., Pittsburg, have recently purchased 15 acres of land adjoining their South Side plant. The property extends from 31st to 35th Sts. and lies between Carson St. and the Monongahela river. The property is to be used in making further additions to the plant. While these have not yet been definitely decided upon it is probable that the first will be made in the structural fitting shop. Other extensions will also be made within the next few years and will probably include new structural mills. These matters are still under discussion, however. The new Talbot furnace will be placed in operation about April 1, and should it prove a success a second furnace will be built.

Ground was broken last week at South Connellsville, Pa., for the 10-mill sheet plant of the Rolling Mill Co. of America, promoted by George J. Humbert, formerly manager of the Connellsville plant of the American Tin Plate Co. The mills will be located north of the Aluminum Iron & Sheet Co.'s plant, and a large portion of the company's output will be used in this aluminum coating works. There will be four principal buildings having a floor space of 66,500 square feet. The main building will be 410x108 feet; finishing building, 00x50 feet; packing, shipping and store room 150x30 feet; boiler house 40x80 feet. The buildings will be of steel and brick construction and will be equipped with labor saving machinery throughout. The main building will be commanded by a 15-ton crane. The rolls will be driven by two 36x60-inch Hamilton-Corliss engines with fly wheels 30 feet in diameter and weighing 82 tons. Each engine will be capable of developing 1,600-h. p. All the remainder of the machinery in the plant will be operated by electricity. Although not definitely decided it is stated on reliable authority that the stockholders of the company are considering the advisability of erecting a blast furnace together with a steel plant to provide raw material for the sheet mill.

OPEN PIT FAYEL MINE, EVELETH, MINN. THIS PIT AND THREE SHAFTS MADE POSSIBLE SHIPMENTS OF OVER 1,500,000 TONS IN 1901.

At the annual meeting of the A. Garrison Foundry Co. of Pittsburg to be held on March 24, a proposition providing for an increase in the capital stock will be presented. The increase is to provide for improvements and enlargements to the plant.

PERSONAL.

W. E. Taylor has resigned as general manager, vice-president and a member of the board of directors of the Republic Iron & Steel Co., the change to become effective on Feb. 1. At present Mr. Taylor has no definite plans for the future and will return to Pittsburg, where his family resides. Before becoming connected with the Republic Iron & Steel Co., Mr. Taylor was one of the officials of the American Steel Hoop Co.

Andrew Welsh, of Youngstown, O., formerly master mechanic of the Bessemer plant of the Republic Iron & Steel Co. at Youngstown, has accepted the position of master mechanic of the rolling mills of the American Car & Foundry Co. plants at Detroit and St. Louis.

Mitt McDonald, formerly employed at the Edgar Thomson plant of the Carnegie Steel Co. has been appointed night superintendent of the converting department of the Bessemer plant of the Republic Iron & Steel Co., Youngstown, O.

Richard Henry Lee, formerly superintendent of the steel plant of the Colorado Fuel & Iron Co., has been appointed superintendent of the blast furnaces of the company. E. J. Rust, formerly chief engineer at the steel works, has been appointed superintendent of the Minnequa plant. His successor has not yet been named.

Fred D. Wilkerson has been elected general manager of the Biwabik Mining Co. of Minnesota.

O. O. Laudig, superintendent of the blast furnaces of the Joliet, Ill., plant of the Illinois Steel Co., has been appointed superintendent of the South Chicago plant of the same company.

Frederick M. Strong, manager of the Elwood, Ind., plant of the American Tin Plate Co., has resigned. He is at the head of the new company which will erect a new tin plate plant at Greencastle, Ind., and which was recently incorporated. Clark A. Price will have charge of the plant until Mr. Strong's successor is appointed.

A. R. Fraser, who some weeks ago tendered his resignation as secretary and treasurer and a director of the Pressed Steel Car Co. of Pittsburg, will become a director and treasurer of the new Standard Steel Car Co. recently organized.

James Belden has resigned as assistant to Chairman Don H. Bacon of the Tennessee Coal, Iron & Railroad Co. It is not believed that the position will be filled again.

L. E. Thomas, formerly assistant master mechanic of the Ohio plant of the National Steel Co., Youngstown, O., has been appointed assistant superintendent of the Lloyd Booth plant of the United Engineering & Foundry Co. of the same place.

An error was made in the statement in our issue of Jan. 16 that Joseph Rayser had been appointed manager of the Graham Iron Co., Graham, Va. Walter Graham is vice-president and general manager. Mr. Rayser has accepted the position of foundryman.

P. P. Evans, associate member American Society of Civil Engineers, formerly with the King Bridge Co., in charge of the contracting department of the Boston office, has accepted the position of contracting engineer with the Osborn Engineering Co., and will have his headquarters at the company's main office in the Osborn building, Cleveland.

G. Mowling, a director in the firm of McPherson & Son, machinery and iron merchants, Melbourne, Australia, was in Cleveland last week visiting a number of machinery manufacturers.

Barney Marron, formerly connected with the Illinois Steel Co., has been appointed superintendent of the Buffalo Union Furnace Co.'s furnaces at Buffalo, succeeding F. E. Bachman resigned.

Wm. H. Johnston, of Ishpeming, Mich., has been appointed general superintendent of the Marquette range properties of the United States Steel Corporation.

John H. Palmer, formerly president of the American Rolling Mill Co., Chicago, has severed active connection with that company, to become president of a large malleable iron concern that is being organized in Chicago. He still remains on the board of directors of the former company, however.

W. L. Simonton, general manager of the Emlyn Iron Works, East Chicago, Ind., has been appointed general manager of the Republic Iron & Steel Co. to succeed W. E. Taylor, who retires on Feb. 1. Mr. Simonton is well fitted for the position having been engaged in the iron and steel business for nearly 20 years. When a boy he secured a position with the Brown-Bonnell Iron Co. at Youngstown, O., and after working his way up to chief of the order department of the company he took charge of the rolling mill department of the American Car & Foundry Co. at Detroit, Mich., in 1894. In 1898 he became general manager of the Inland Iron & Steel Co. at East Chicago, Ind., and when the Republic Iron & Steel Co. was formed he was made manager of the plants of the combine in the Indiana gas belt. He was later appointed assistant to George M. Bard, chief of the operating department with offices at Chicago. In August, 1900, he became manager of the Emlyn Iron Works.

Edwin H. Martin, superintendent of the Diamond State Steel Co., Wilmington, Del., has tendered his resignation to accept a position with the Carnegie Steel Co.

Twelve representatives of the American Sheet Steel Co. spent several days in Pittsburg this week, visiting the various plants of the company in the Pittsburg district. The party included James L. Sharkey, New York; Thomas W. Simpers, Philadelphia; W. H. Eaton, H. T. Bennett, Chicago; W. J. Wettstein, St. Louis; S. J. Waterman, Cincinnati; Lee Chamberlin, Los Angeles; L. A. Hastings, Denver; W. T. Shannon, Chattanooga; S. L. Mitchell, New Orleans; R. R. Hoge, Portland, Ore., and F. A. Goodrich, Detroit.

Open-Hearth Plant at Cortland, N. Y.

Wickwire Bros., of Cortland, N. Y., have contracted with the Wellman-Seaver Engineering Co., of Cleveland, for the erection of a basic steel plant. There will be three 35-ton open-hearth furnaces and a blooming and billet mill. Work will begin early in the spring and the plant will be completed in the fall. The company has purchased 10 acres of land adjoining its property. Last year a rod mill designed by the Morgan Construction Co. was built and it is now the purpose to provide for steel supply. The company manufactures wire cloth, netting and wire goods.

The Wheeling Steel & Iron Co., Wheeling, W. Va., has advanced the wages of its puddlers from $5.50 to $5.75 per ton. The increase dates back to January 1.

According to a Toledo, O., dispatch Thomas H. Tracy, president of the Toledo Railway & Terminal Co., a new belt line, announces that a contract has just been closed whereby a company of outside capitalists will construct a blast furnace in Toledo to cost a million dollars and employ about 500 men. We have asked Mr. Tracy for confirmation of this report, but have no response.

Application for the dissolution of the Buffalo Charcoal Iron Co. has been made at Buffalo, N. Y. The company's property is now owned by the Buffalo Union Furnace Co.

At the annual meeting of stockholders of the Republic Iron Co., held in Cleveland, Jan. 15, the following officers were elected: President and treasurer, W. D. Rees; vice-president, Samuel Mather; secretary, William B. Castle; directors, H. B. Perkins, G. W. R. Matteson, Samuel Mather, Peter White, J. V. Painter, W. D. Rees, N. M. Kaufman, A. Hart, W. F. Dummer.

A fire starting in the paint shop of the Variety Iron Works, Cleveland, Jan. 21, did slight damage to the foundry, chiefly from water on the molding floor.

J. E. Bowen & Co., Norfolk, Va., are in the market for a 15-horsepower hoisting engine complete with boiler.

The Allis-Chalmers Co., Chicago, has received an order from the Colorado Fuel & Iron Co., Pueblo, Col., for another mill engine of 2,000-h. p.

OBITUARY.

Charles Pemberton Deane, of the International Pump Co. of New York, died at the home of his sister, Springfield, Mass., on Thursday, Jan. 9, in his 57th year. Death was caused by blood poisoning resulting from erysipelas. Mr. Deane was born in Boston Jan. 20, 1845. He went to Springfield in 1857 with his father, the late George H. Deane, when the latter was appointed agent for the management of the mills at Ludlow, Mass. He was educated in part at Brown university and after leaving college joined his father in the work at Ludlow. He had a marked talent for mechanical and scientific pursuits and when still quite a young man invented the Deane steam pump, which later became the basis of a large industry. Early in the seventies the elder Deane gave up his position at Ludlow and joined his son in the manufacture of the Deane pump. Later the enterprise was organized as a corporation and moved to Holyoke, Mass., where it had the strong backing of Stephen Holman of Worcester, Mass., and enjoyed a long career of prosperity. Charles Deane continued one of the active managers of the large business until the company was finally absorbed in 1899, by the International Pump Co., with which he had been associated.

John Wool Griswold.

John Wool Griswold died suddenly at Virginia Hotel, Chicago, Jan. 2, aged 50. He came of one of the most distinguished families of Troy, N. Y. He was a nephew of the late Gen. John E. Wool and a son of John A. Griswold, who was mayor of Troy, represented his district in Congress and was once the Republican candidate for Governor of New York. During the war he was one of the three men who constructed the Monitor which in 1862 destroyed the Merrimac. He established the first steel wire mill in this country, which was continued by John Wool Griswold under the name of Griswold Bros. J. W. Griswold was superintendent of the Bessemer steel works at Troy in 1878. He was a trustee of the Troy Savings Bank and was interested in the Griswold Wire Co., Braddock, Pa., in the J. Wool Griswold Wire Mfg. Co., Troy, N. Y., and in the Dillon-Griswold Wire Co., Sterling, Ill., besides other interests. His wife and three children, besides three sisters and two brothers, survive him.

E. V. Clergue.

Ernest Victor Clergue, who was connected with the industrial works at Sault Ste. Marie, Mich., died at Chicago last week of heart trouble. He was 41 years old.

Electric Railways for Industrial Purposes.

Electrically driven cars have long been an adjunct of industrial operations, and trolley railways have been employed for manufacturing plants, in mines and for contractors' operations. Electric power is now in most cases easily available and the surplus electric power can be used with little or no additional expense, instead of animal or steam power. The building of electric railways for industrial purposes has been given more and more attention by the manufacturers of railroad materials. Among the firms that have realized good results in equipping this kind of roads and running them economically, is that of Arthur Koppel, of New York. This firm has built many electric roads for industrial purposes and has also developed portable electric railroads, thus making an electric railroad available for those who have to use it at different places and at each place for a comparatively short time.

The Arthur Koppel portable electric railway can be laid down and completely equipped within a very short time. All the parts composing the equipment are light and easily handled. Details are worked out so that there is no difficulty and specially constructed and patented cars for stringing the trolley wire enter into the equipment. These railways have been built in many countries and for many different purposes. Factory roads have been built to bring the raw material into the plant, carry the different materials around, and finally take the finished product to the station, for mines, for contractors and for plantations. They have been employed also for passenger traffic. This firm put up in its office at 66 Broad St., an exact model of such an electric railroad in one-tenth actual size. This road is equipped with track, overhead system, electric locomotive and different types of cars, including coal, flat, plantation and contractors' cars, as well as passenger cars. Any one interested in the operation of such railroads is invited to inspect the model. This firm has also issued a special catalogue relating to these railroads, which will be mailed upon application.

Projected Blast Furnace at Sharpsville, Pa.

The name of a newly organized iron manufacturing company at Sharpsville, Pa., has been changed from Riverside Iron Co. to Northside Iron Co., the discovery being made that the former name had already been taken by a Pennsylvania corporation. We are advised by the company that it will build a blast furnace for the manufacture of coke iron in the vicinity of Sharpsville, the general offices being in Sharpsville. The company is composed of S. A. Robinson, C. B. Kantner, Andrew Nickle, C. S. Robinson, W. V. Robinson and H. W. Robinson, all of Sharpsville. The officers are: S. A. Robinson, president; Andrew Nickle, vice-president; C. B. Kantner, secretary and treasurer.

Youngstown Iron Sheet & Tube Co.

The Youngstown Iron Sheet & Tube Co., of Youngstown, O., advises us that the report in local papers that it was rolling scrap to cover its buildings is incorrect. The company will not use scrap sheets for this purpose. When the buildings were going up an effort was made to purchase pure puddled iron sheets free from scrap, but it was not possible to obtain them. The company then decided to make puddled iron sheets on its own mills for covering its buildings, and this will now be done. The first iron was rolled on Monday, Jan. 20, at the new puddle mill. Six puddling furnaces were started and eight more will be fired this week. It is expected that the sheet mill will be ready for operation next week. In its announcement issued this month, the company says that it is able to make prompt shipments of New Process galvanized sheets and is entering orders for double refined puddled iron sheets and common iron sheets.

New Converter and Rod Mill Records.

Records in the Bessemer converting department at the South Works of the Illinois Steel Co., Chicago, were again broken Jan. 16. On this date 162 heats were produced in the day turn, making a total of 305 heats for 24 hours. The previous record was 153 heats in 12 hours, and 287 heats for 24 hours.

On Jan. 11, at the Joliet works of the Illinois Steel Co., 252 tons, 900 pounds of No. 5 rods were produced in the day turn of 12 hours, which is greater than the previous world's record on No. 5 rods made by this mill.

The Chicago office of the Oil City Boiler Works, Oil City, Pa., has received an order from the Detroit Lubricator Co., Detroit, Mich., for a 250-h. p. water-tube boiler, and an order from the Crystal Ice Co., Paragould, Ark., for two boilers of 125-h. p. each.

The blooming mill of the Tidewater Steel Co. at Chester, Pa., which has not been operated for several years, will be placed in operation within a few weeks. Improvements are being made in the open-hearth department which will materially increase the steel output. Heretofore the product of the blast furnace was cast in chills and the broken pigs were charged into the open-hearth furnaces. A trestle is now being built from the furnace leading into the various open-hearth furnaces which will permit the charging of the furnaces with direct metal.

The Ellington Mfg. Co., Quincy, Ill., has just completed its foundry, which is modern in all its equipment. It has a floor space of 70,000 square feet, and a capacity of 20 tons per day of air furnace malleable iron castings, and 50 tons per day of gray iron castings.

A NOVEL METALLIC HOSE.

The successful conveyance of corrosive or otherwise injurious liquids and gases by means of flexible steel and copper pipes is an art but little understood by the average engineer. The difficulties in the way of a really practical tube in a flexible form capable of withstanding high pressures can be readily imagined and the various attempts at a solution of the problems involved are of very general interest in these high pressure days of steam, air and other gases. A novel invention in this line is being introduced to the engineering world, sufficiently practical to have been adopted by the German Navy

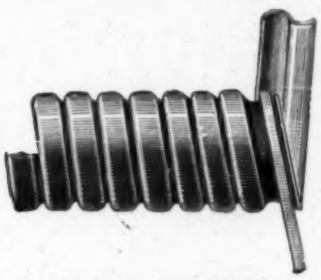


FIG. 1.—SIMPLE FORM OF METALLIC HOSE.

and it is already in use for railroad and mining engineering. The metal hose that has been made heretofore has been known to the trade as flexible metallic tubing. This is quite different from metal hose, as it consists of a single tube which can be used with satisfactory results only in places where the hose is not handled, twisted or subjected to external abuse. This tubing has been made in England and France. The metal hose referred to is quite different, being known as double metal hose.

This invention is not an india rubber tube inclosed in metal,

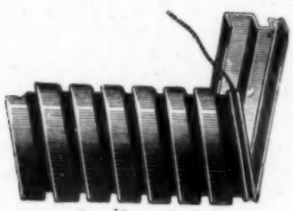


FIG. 2.—ASBESTOS PACKED TUBING.

but is constructed from a metallic tape which is rolled up in the form of a spiral so that the edges overlap and fit into each other tightly without detracting from its power of motion. As the tape is rolled up it forms a groove for the reception of a packing which is completely inclosed in the metal as it rolls, where it remains fully protected from internal or external wear or abuse. The packing causes the tubing to be perfectly tight, while the jointing induces flexibility. As this hose will not kink, crush, nor blister, it always delivers to its full capacity, and will assure a relatively larger opening than rubber hose

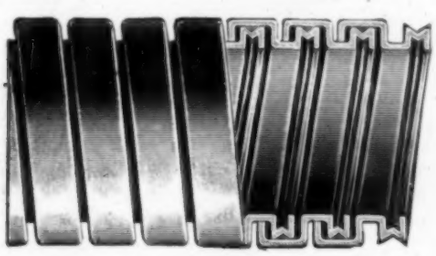


FIG 3 —SECTIONAL VIEW OF ASBESTOS PACKED HOSE

of equal diameter. As all couplings and connections are made from the outside, leaving the full internal diameter constantly available, a smaller size of metal hose is available.

Metal hose of this construction is defined as being made under three systems, numbered respectively 1, 2 and 3. In system 1 the joint is packed with rubber lying between the overlapping edges of the metal, as in Fig. 1. This hose is made only for light work; such as gas and for discharging pipes where there is no great pressure. The pipes in system 2 are packed with asbestos, but the material does not lie between the overlapping edges as in the case of Fig. 1; it is supported by a V-shaped groove, formed in one of the abutting surfaces. This construction is clearly shown in Figs. 2, 3 and 4. The double hose, Fig. 4, for steam and other high pressure service is constructed of two tubes, one inserted within the other and both firmly fastened at the ends, the coils of each being respectively right and left handed. The coils of a single tube may become untwisted through careless handling or when subjected to great strain; the double hose, however, is capable of meeting these requirements and is said to be capable of retaining a pressure in special cases up to 3,000 pounds to the square inch.

Metal hose has become a necessity in many cases where rubber tubing is practically worthless, the latter becoming vulcanized and charred at a comparatively low temperature.

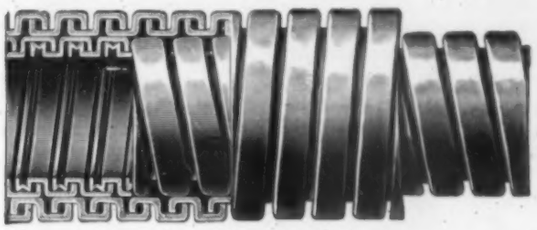


FIG. 4.—DOUBLE HOSE FOR STEAM.

It cannot, however, be drawn over the end pieces of the connections like india rubber. When of small diameter and intended for light pressure it is fixed by means of special connecting pieces which are cemented or soldered to the hose. In the case of larger sizes and where a high heat is encountered, the fittings are similar to the glands in general use for valves, piston rods, etc., on pumps and engines. For the conveyance of greasy liquids which speedily attack rubber, this hose gives good results, as the flexibility is increased by the lubricating nature of the fluid, and its life is thereby prolonged.

The invention is being introduced to the trade by the American Metal Hose Co., Chicago.

Re-Importing Southern Iron from Germany.

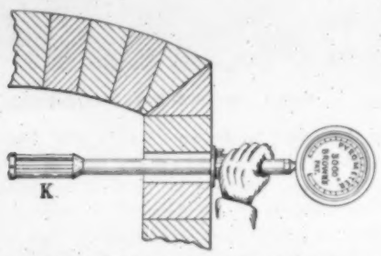
WASHINGTON, Jan. 22.—Officials of the customs division of the Treasury Department have received a letter from a southern furnace company which shows that the German iron market is still greatly depressed. Several months ago the Woodward Iron Co., of Jefferson county, Ala., shipped a quantity of pig iron to Berlin, where its representatives had always found an excellent market. Until a few days ago the consignment, amounting to 300 tons, was stored away in a Berlin warehouse. There was no sale for it except at a great sacrifice. Having an urgent demand in domestic fields, the owners have asked the Treasury Department if they may enter the pig iron at the New York custom house free of tariff duties. Under the law any American products exported to foreign territory may be brought back free of duty. Officers of the Woodward Iron Co. were informed to this effect, and advised that to exhibit the necessary papers showing that the pig iron originally produced in the United States will be all that is required to get it through on the free list.

The Newport Rolling Mill Co., Newport, Ky., is completing three new finishing mills and two cold rolling mills. These will be in operation about the middle of February, and will be used in the manufacture of steel sheets from 10 gauge up, and from 42 inches wide to 120 inches long. The mills have been running with the exception of a two-weeks' interval continuously during the past year, and are supplied with orders for the first quarter of 1902. The company has turned down a large tonnage in the corrugating and roofing departments during the past three months.

The new buildings for the Trenton Iron Co., Trenton, N. J., are fast nearing completion and the installation of wire-making machinery will be commenced with shortly. Steel wire for pianos, umbrellas, etc., is manufactured in large quantities by this company.

DECISION FOR THE BROWN PYROMETER.

The inventions of Edward Brown, of Philadelphia, for the improvement of pyrometers, following the introduction of his graphite stem pyrometer in 1870 are well known to iron manufacturers. One of his latest inventions, patented in 1894, was a pyrometer for indicating in a few seconds the temperature of heated air or gas up to 3,000°. The instrument was novel in construction and principle. The effort of August Zaubitz, of New York, to introduce a pyrometer of exactly the same construction led to the beginning of a suit against him in April, 1897, in which Mr. Brown alleged infringement. The defendant in the trial of the case produced eight witnesses who testified that they had seen the pyrometer made in his shop in quantities, or had purchased them from him years before Mr. Brown's invention. Mr. Brown brought forward Mr. Zaubitz's workman and a boy who were in his shop in the period in question and who testified that no pyrometers like those of the Brown patent were made in the time referred to. In spite of this conflict of testimony Mr. Brown obtained a decree, the decision being given by Judge Coxe in the United States Circuit Court, Southern District of New York. The novel feature of the



BROWN PLATINUM STRIP PYROMETER

patent consists in the introduction of a platinum expansion strip, V-shaped in cross section. In his review of the evidence the court referred to the complainant as a mechanical engineer 65 years of age who became interested in pyrometers 35 years ago and has been dealing in them ever since. In 1869 he obtained a patent for improvements in pyrometers and has received several other similar patents, and the judge averred that "practically and theoretically no man in the United States is better acquainted with the art than he is." The court found that either the defendant copied from the complainant or vice versa, and his conclusion was that the Zaubitz pyrometer was copied from the Brown platinum strip pyrometer, the presumption that this was the case being increased by the fact that Zaubitz in his circulars and catalogues published in 1892 had exact copies of the pictures of Brown's pyrometers as contained in the latter's catalogue. The award of a gold medal by the Franklin Institute in 1896 to Mr. Brown for his inventions, among which was the platinum pyrometer, was accepted by the court as showing that the Institute was convinced by investigation that the complainant was the true inventor.

Mr. Brown, referring to the case and its outcome, considers it to be another illustration of the defect in our patent laws, the Government, with the best intention, being powerless to recompense a patentee for years of loss and litigation in the maintenance of his rights.

One of the Lorain Steel Co.'s blast furnaces at Lorain, O., blew out early in the month for relining and will be idle until the latter part of February.

The following furnaces of the Illinois Steel Co., which have been idle for some time for lack of fuel, were blown in last week: No. 9 at South Chicago, No. 1 at Bay View and No. 4 at the Union Works, Chicago.

At the annual meeting of the Buckeye Malleable Iron & Coupler Co. of Columbus, O., directors were elected as follows: W. F. Goodspeed, Frank Rockefeller, John G. Deshler, R. D. Warner, T. P. Linn, S. P. Bush and R. M. Rownd. Major Goodspeed was elected president and treasurer and Mr. Bush second vice-president and general manager.

THE CARNEGIE INSTITUTION.

Official announcement has been made recently at Washington of the board of trustees of the Carnegie Institution, which has been incorporated under the $10,000,000 gift of Andrew Carnegie. Dr. Chas. D. Walcott, secretary of the incorporators, made the statement in accordance with Mr. Carnegie's wish. The board of trustees, as announced consists of the President of the United States, the president of the Senate, the speaker of the House, the secretary of the Smithsonian Institution, and the president of the National Academy of Sciences, ex officio, and the following regular trustees: Grover Cleveland, Abram S. Hewitt, New Jersey; Andrew D. White, John S. Billings, Elihu Root, Seth Low, New York; William N. Frew, Wayne MacVeagh, Dr. S. Weir Mitchell, Pennsylvania; Lyman J. Gage, Charles L. Hutchinson, Illinois; Daniel C. Gilman, Maryland; Henry L. Higginson, Massachusetts; Henry Hitchcock, Missouri; William Lindsay, Kentucky; D. O. Mills, W. W. Morrow, California; John C. Spooner, Wisconsin; Edward D. White, Louisiana; Charles D. Walcott, Carroll D. Wright and John Hay, District of Columbia. The trustees will organize on Jan. 29. It is announced that there will be no university buildings, though possibly a central building at Washington for purposes of administration. The aims of the new institution are announced to be:

"First—To increase the efficiency of the universities and other institutions of learning throughout the country by utilizing and adding to their existing facilities and by aiding teachers in the various institutions for experimental and other work in these institutions as far as may be advisable. Second—To discover the exceptional man in every department of study, whenever and wherever found, and enable him by financial aid to make the work for which he seems specially designed his life work. Third. To promote original research, paying great attention thereto, as being one of the chief purposes of this institution. Fourth—To increase facilities for higher education. Fifth—To enable such students as may find Washington the best point for their special studies to avail themselves of such advantages as may be open to them in the museums, libraries, laboratories, observatories, meteorological, pisciculture and forestry schools and kindred institutions of the several departments of the Government. Sixth—To ensure the prompt publication and distribution of the results of scientific investigation, a field considered to be highly important.

"These and kindred objects may be attained by providing the necessary apparatus for experimental work, by employing able teachers from the various institutions in Washington or elsewhere, and by enabling men fitted for special work to devote themselves to it, through salaried fellowships or scholarships, or through salaries with or without pensions in old age, or through aid in other forms to such men as continue their special work at seats of learning throughout the world."

Cedar Point Furnace to be Started.

Pilling & Crane, Girard Bldg., Philadelphia, have leased the Cedar Point Furnace, Port Henry, N. Y., from Witherbee, Sherman & Co., Inc., and will install additional equipment, including blowing engine, boilers, etc. This will increase the capacity of the furnace to 175 tons a day. Frank E. Bachman, formerly of the Buffalo Union Furnace Co., Buffalo, has taken charge and will be general manager. Pilling & Crane have not leased the Crown Point furnaces, as reported, nor have they leased an iron mine, but the Cedar Point furnace will use Port Henry ores, produced by Witherbee, Sherman & Co. It is the expectation to have the furnace in operation by April 1. The product will be principally basic iron.

The American Rolling Mill Corporation, which reorganized at the beginning of the year and increased its capital stock to $1,000,000, has elected the following officers: President, L. C. Straight; secretary, F. W. Peck, Jr.; general manager, W. I. Moody. The following are directors: F. W. Peck, Sr., John S. Cooper, W. I. Moody, John H. Palmer and C. I. Peck. The company operates mills at Muncie, Ind., Muskegon, Mich., and Sandwich, Ill.

THE MANUFACTURE OF STEEL WHEELS.

The constantly extending field of steel wheels has directed the attention of manufacturers of such wheels to the problems of strength with lightness and durability with moderate first cost. Some features of the products of the Electric Wheel Co., of Quincy, Ill., are shown in the accompanying illustration. A staggered oval spoke wheel is the type this company has developed as the result of a series of improvements. A finished wheel is shown in Fig. 1, this being the extra strong steel wheel manufactured by this company and calculated for loads of from 6,000 to 12,000 pounds. It is designed for logging, for freight trucks in cities, for well drills, portable engines, ore wagons, etc. The tires are made ½, ⅝ and ¾ inch in thickness. The construction of hubs, spokes and tires is illustrated in Figs. 2 and 3. Fig. 2 shows the spokes as they are cast into the hubs. Experiments with malleable steel, brass and cast iron hubs have resulted in the adoption of the last named. The staggered oval spokes are cast in the hub by a patented process. The securing of the spokes in the tire by means of a large head on one side and a large shoulder on the other, is illustrated in Fig. 3. This is done when the spoke is at a welding heat and there is no danger of crystallization such as takes place when the spoke is riveted cold. The countersinking is clear through the tire. The tire and spokes are of wrought steel. Between the ends of the spokes and the axle is solid cast iron. In the manufacture of the 44-inch and 30-inch wheels of the Electric Wheel Co. the process of manufacture consists in upsetting on the hub end of the spoke a flat head similar to that on the ordinary steel nail. This being cast in the hub renders it impossible for the spoke to pull out and by the thin edges melting in the cast iron hub the spoke becomes part of the hub, just as two pieces of iron become welded.

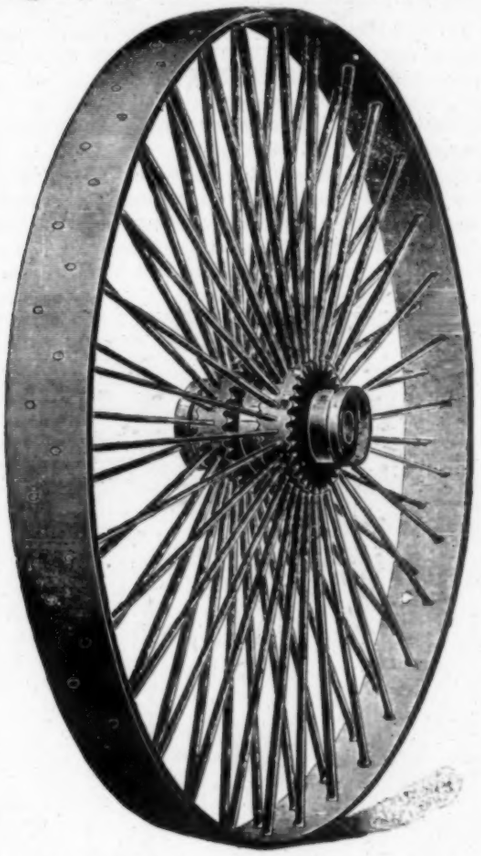


FIG. 1.—EXTRA STRONG STEEL WHEEL.

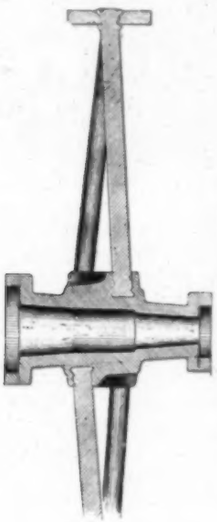


FIG. 2.

FIG. 3.

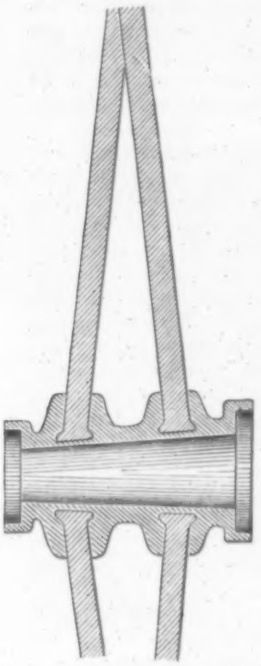


FIG. 4.

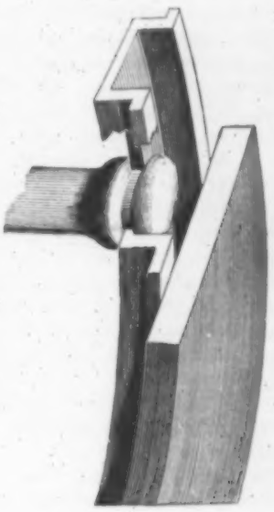


FIG. 5.

In Figs. 5 and 6 is shown the construction of these wheels with channel steel tires and flat steel tires shrunk over them. Such wheels are designed for service over rough country and there is a good demand for them from certain quarters.

An article in our last issue credited the Wilmarth & Morman Co., Grand Rapids, Mich., with the manufacture of "Yankee" drill grinders. The "Yankee" is the gauge-jaw type of machine made by the predecessors of this company at Kalamazoo and the Wilmarth & Morman Co. has named their present line of improved grinding machinery the "New Yankee."

Work on the new $1,000,000 basic open hearth plant of the Alan Wood Iron & Steel Co., near Conshohocken, Pa., is well under way. The five 50-ton furnaces under erection will have an output of about 100,000 tons of steel annually. The plant will also be equipped with billet and slabbing mills as the product will largely be used in the Alan Wood Co.'s sheet mills at Conshohocken. At the present time the sheet mills are dependent upon the open market for their supply of steel, but when completed the mill will not only be able to supply all the sheet bars required, but there will be a surplus to offer in the open market. The plant will be placed in operation early in 1903.

The Center Foundry & Machine Co., Wheeling, W. Va., for manufacturing castings and machinery of all kinds, has been chartered, with an authorized capital of $50,000, by M. N. Cecil, A. T. Young and Mary Young.

CINCINNATI MACHINERY MARKET.

CINCINNATI, Jan. 20.—In the machine tool business conditions are quite satisfactory. The demand keeps up right along and while there is nothing coming of a foreign inquiry the domestic trade is good. It seems as though the machine tool manufacturers are not pushed quite as hard as they have been some months previous to this and deliveries are somewhat more satisfactory from the standpoint of the buyer. This, however, is as largely due to the fact that manufacturers have made shift to increase their capacity in various ways as well as that the inquiries have not been quite as urgent.

A man from St. Petersburg calling on one of the large machine tool manufacturers said that conditions are now over there just about as they have been for some time and just as they were a year ago—in other words, quiet. The same report is received from Germany and France and most of the continental countries. England is somewhat better than the others.

The American Laundry Machinery Co. has purchased a tract of four acres on Spring Grove Ave., just outside the limits of St. Bernard, and will erect thereon a large factory building or group of buildings. The main building will be an L shape, the Spring Grove Ave. front being 238 by 100 feet and two stories in height, while the other wing on the C. H. & D. and B. & O. S. W. connection track will be 320 feet long by 100 feet wide and one large story high. This main building will be the machine shop and setting up rooms and the ware rooms, while in addition to this building there will be a carpenter shop detached from the other, and also a separate power plant. The carpenter shop will be 140 by 87 feet. The buildings will be rushed to completion as rapidly as possible, the company being in need of the new quarters as it has been occupying temporary buildings ever since the fire that destroyed the old plant. It was rather fortunate that the company had already decided to build even before the fire occurred. The cost of the new improvements will be about $100,000.

The Block-Pollak Iron Co. has been compelled to put on another shift of men, making three shifts now working. The company has recently been awarded a large contract for axles by a large car building company and is so full of orders that increased facilities have been made necessary. The new machine shop was begun to be operated a few days after the first of the year, which gives the concern one of the best equipped shops for the manufacture of shaftings, axles and similar work in the country.

The Tudor Boiler Mfg. Co. has just set up a large 300-h. p. vertical water tube boiler that is the first of a battery that will be used to supply heat, light and power for almost an entire block bounded by Fourth and Fifth and Vine and Race Sts. In this block the Emerys own two hotels, several restaurants, stores and the arcade, all of which are furnished with light, heat and power from the central plant. One store in the arcade had to be torn out in order to get the new boiler in. It stands 32 feet high, and is 80 inches in diameter. The Tudor Boiler Mfg. Co. has just added another building to its shops and is now equipping it with additional machine tools, including planers and lathes of large size.

E. H. Hargrave, president of the Cincinnati Tool Co., has been appointed vice consul at Cincinnati of the Republic of Paraguay. Mr. Hargrave has made frequent and extended trips into South America and is well acquainted in Paraguay, where he has built up quite a nice trade for his company.

The J. A. Fay & Egan Co. has just received a considerable order for some special wood-working machinery from the Pressed Steel Car Co. of Pittsburg.

The American Tool Works Co. has received a letter from the Russian agent of its New York representative in which the conditions in Russia are described as entirely out of the question for American machine tool manufacturers to sell in that country until the tariff duties are changed. This company was really the pioneer in introducing American machine tools into Russia eight or ten years ago, and it has seen the trade dwindle down to almost nothing.

The Bullock Electric Mfg. Co. has let most of the contracts for the new building that will be erected adjoining the plant that when completed will make an addition of 1,200 feet. This company will entertain this week at the Cincinnati headquarters 30 of the agents of the company in all parts of the United States from New York to San Francisco.

The National Steel Foundry Co., recently organized, has concluded arrangements for the transfer of the ten acres of land on the Big Four railroad near Sharon and will proceed at once to erect the two large buildings on the site.

ARTISTIC ELEVATOR CAR.

The elevator car design in the accompanying illustration was furnished by the J. E. Bolles Iron & Wire Works, of Detroit, Mich., for the Butler building, New York. The cut shows how such work can be designed and finished artistically, besides representing new features in construction. This order included a neat folding gate as special protection in the doorway. The makers have recently furnished elevator enclos-

ures and car for the Arlington Hotel, Marlin, Tex., and for the eight-story Cumberland apartments, Washington, D. C., besides other contracts. The design illustrated is known as the company's No. 251.

At the annual meeting of the Columbus Metal Trades Association held last week at Columbus, O., officers were elected as follows: President, G. W. Brown, of the Case Mfg. Co.; vice-president, J. C. Hearn, of the North Side Machine Works; secretary, H. G. Simpson, of the Simpson Iron Co.; treasurer, A. K. Rarig, of the Rarig Engineering Co.; executive committee, Charles A. Klie, of the Columbus Watch Co.; C. D. Hudgens, of the Columbus Machine Co.; Robert Jeffrey, of the Jeffrey Mfg. Co.; W. M. Scott, of the P. Hayden Foundry and Machine Co., and President Brown, ex-officio.

A. L. Ide & Co., Springfield, Ill., has sold two 200-h. p. engines to the Chicago, Burlington & Quincy Railroad Co. for the operation of an 8-mile electric branch extending from Deadwood to Leeds, S. D.

REFRACTORY MATERIALS.

BY PERCY LONGMUIR.

Much of the success of metallurgical operations depends upon the condition of the interior of furnaces, upon the length of time these interior portions will resist intense or intermittent heats, reducing or oxidizing atmospheres, on the scouring action of basic oxides, and on the general wear and tear to which such structures are exposed. In certain cases, as, for instance, the basic Bessemer or open-hearth steel-making process, the lining itself plays no small part in the actual conduct of the operation. Briefly, then, the general conditions refractory materials are expected to meet include:

1. The expansion or contraction due to heating and cooling, resulting from intermittent working.

2. The cutting action of flames, the abrading effect of molten metal, and the searching action of metallic oxides or scouring slags.

3. Variations in atmosphere, such as reducing or oxidizing.

4. Mechanical properties, such as to withstand the rough wear and tear of charging solid metal—often in heavy weights—and other more or less rough treatment to which these furnaces are subject.

It will be seen that these requirements are by no means light or easy to meet. Nevertheless, nature, always bountiful, has provided manay substances which, used in combination with mechanical skill and scientific knowledge, enable the metallurgist more or less successfully to meet the ever-increasing strain to which his furnaces are subject. A brief résumé of these materials and of their general properties may not be without interest, and as the keener conditions of today demand that every detail be studied and worked to the best advantage no apology is necessary for introducing the subject of furnace linings.

This matter, dear to the heart—more so to the pocket—of the furnace owner is one that will permit of development. Working temperatures are increasing and a corresponding increase in the refractivity of brick or crucible must follow. Brass founders demand crucibles of higher earning capacity, of longer working life. The crucible steel founder requires in the materials composing his pots a combination that will successfully and commercially produce steels of dead mild quality. It is hardly necessary to remind my readers that in the ordinary clay steel melting pot carbon is taken up from the coke dust used in the crucible mixture, and at the same time silicon is reduced from the silica of the clay, also passing into the steel. These reactions are easily allowed for in producing average or ordinary qualities of steel, but assume importance in the case of extremely mild qualities of metal such as are required in electrical construction.

It is hardly necessary to refer to the important part played by the refractory materials in the construction and working life of a modern open-hearth furnace. Such a plant may run a long and profitable life, or it may fail entirely when comparatively few tons of steel have been produced.

The key to the four requirements quoted earlier in the paper lies in clear scientific knowledge of the materials handled and correct mechanical use of them. For general purposes refractory materials may be conveniently grouped into the three following classes: (1) Acid, (2) neutral, (3) basic.

Acid Refractories.

The first group or acid variety consist chiefly of silica, the oxide of silicon, which is found plentifully distributed in the crust of the earth. Silica acting as an acid will combine with various bases forming fusible silicates—a fact of no little import to the furnace builder. Acids, with the one exception of hydrofluoric, have no solvent action on silica; but it is readily soluble in alkaline solutions. It is extremely refractory, and can only be fused at the highest temperature of the oxy-hydrogen blow pipe. In nature silica is found in the form of quartz, and in a less pure state as flint, chalcedony, agate, etc. Sand is usually quartz, sometimes flint in a minute state of division, in which form silica constitutes all sandstones.

Silica is known to the mineralogist in four forms: (1) Quartz and its varieties, (2) Chalcedony and its varieties, (3) Jasper and its varieties, (4) Hydrous silica and its varieties. The forms of silica of immediate interest to the metallurgist are varieties of sandstones, which when used in a native state are technically known as "firestones," various sands, ganisters and similar silicious materials which may be used in practice in a natural state or after suitable treatment in the form of bricks, etc. Ganister, a local name for an argillaceous sandstone found in the carboniferous formations of South Yorkshire and other districts of Great Britain, is a close-grained, dark-colored rock. It is a fine-grained sandstone, containing no mica and possessing therefore no cleavage. The clayey matter is present in just sufficient quantity to allow of the material being molded. Analysis varies within the following limits:

Silica	87	to 95	per cent
Alumina	4	to 5	per cent
Ferric oxide	0	to 0.8	per cent
Lime and magnesia	0.25	to 0.75	per cent
Alkalis	0	to 1	per cent

An analysis of a Yorkshire ganister yielded in the writer's hands:

Silica	95 per cent
Alumina	3 per cent
Ferric oxide	1.5 per cent
Lime and magnesia	0.5 per cent

The ganister is ground under edge runners into a coarse powder, and if the mass does not "bind" well, lime cream may be added, which when burned forms silicate of lime—in effect a glazed surface. This addition of lime must in all cases be kept low, and only added when the composition warrants it. Otherwise the essential properties of the material are destroyed. Ganister in this condition is used for lining the acid Bessemer converters, cupola furnaces, crucible, and, in fact, any form of furnace which will permit of the material being rammed round a wooden model. On the other hand, this ganister ground may be molded into fire bricks, which on the market are commercially known as silica brick and permit of a most extensive use in the construction of any form of acid furnace. The composition of silica bricks varies as follows:

Silica	90	to 96.0	per cent
Alumina	3	to 5.0	per cent
Ferric oxide	0.8	to 2.0	per cent
Lime	0.25	to 1.0	per cent
Magnesia	0.1	to 0.5	per cent
Alkalis	0.5	to 1.0	per cent

In constructing furnaces of these bricks good allowance must be made for expansion and all tie rods must be fitted with automatic springs to enable them to meet the expansive and contractive strains.

Of the various sands which form members of the acid group it is only necessary to notice one briefly—silica sand, or as it is sometimes termed, Belgium white sand. The hearth portion of an acid furnace is usually formed of a boiler plate shell, lined first with fire-brick, then silica brick, and the bath proper formed of silica sand. This sand is extremely refractory and in parctice, to make it slightly fuse over, about five per cent of red sand is mixed with the white sand. This bath must be kept in good trim, or, as the melter terms it, "good fettle," and after each heat all worn places or "pools" must be sanded up again and the whole surface of the bath brought to the proper shape. This is readily done, after tapping, by throwing sand with long handled shovels on to all the uneven places and slightly fusing over to level down again. It is an axiom in open-hearth practice that a bad or uneven bottom is fatal to good steel-making and therefore too much care cannot be devoted to this point.

Many silicious or quartzose rocks as sandstones, granites, millstone grits, serpentines, steatites, etc., are highly refractory, will resist changes in temperature without cracking. Hence the use of these rocks as "firestones" on hearth stones of blast furnaces, cementation boxes and in the construction of reverberatory furnaces, etc. In the case of sandstones special care must be taken to bed them in the plane of their stratification to prevent exfoliation; and herein lies one of the chief difficulties in using natural stones for furnace construction. Among other acid materials may be mentioned the use of calcined and ground flints which are nearly pure silica and consequently highly refractory.

Neutral Materials.

The second group of our classification, that of neutral materials, offers wide scope to the metallurgist. They are

termed neutral, owing to the fact that they form no compounds with either basic or acid materials. Hence a neutral material can be used as an isolating medium in the construction of basic furnaces, between basic and acid material. For instance, silica brick may be used to form the roof and the introduction of an isolating layer of, say, chromite, will permit of a basic bed of bauxite or of dolomite. The combination of acid and base has been shown in the introduction of lime to a ganister in order to increase the binding qualities by glazing over the surface with silicate of lime. Hence the importance of purely neutral materials is readily apparent, for as is well known acid and basic materials highly refractory in themselves, when in contact at furnace temperatures result in a more or less fluid slag.

Among the materials composing this group may be mentioned various clays, resulting from the decomposition of granites and felspars, carbon in the form of graphite, coke dust, anthracite and the extremely refractory material, chromite. Clays are of such industrial importance as to warrant an article devoted exclusively to them, and it is proposed to treat of these and of their mixtures in the form of clay crucibles in a later paper.

Some varieties of chromite are extremely refractory—almost more so than silica—and a further advantage is that owing to the neutral property it is unaffected by the presence of either basic or acid elements. It remains practically the same in either reducing or oxidizing atmosphere, a property not possessed by other neutral materials, as for instance carbon. Its chief mechanical drawback is the lack of cohesion. The composition varies within the following wide limits:

Chromic oxide	40 to 60 per cent
Magnesia	6 to 18 per cent
Ferrous oxide	15 to 36 per cent
Alumina	5 to 30 per cent
Ferric oxide	0 to 21 per cent

In building basic furnaces it is of an undoubted advantage to build the roof and sides, or those portions which play no chemical part in the conduct of the operation, of an acid material, such as silica brick. As already stated, to allow the acid sides and basic bed to come in contact with each other at high temperatures would be disastrous and hence in acting as an isolating medium between acid and basic, chromite fills an invaluable position. Up to the present chromite has been found chiefly in the Shetland Islands, in the Bare Hills, Baltimore; in the Ural Mountains and in the Dun Mountains of New Zealand.

Carbon in the form of graphite or plumbago is extremely refractory and will successfully resist high temperatures. In a reducing atmosphere it is practically infusible, though when in a fine state of division and with free access of oxygen it will slowly burn, forming carbon dioxide. The purer forms of graphite contain from 94 to 96 per cent of carbon, but in inferior samples the content of carbon may not exceed 36 per cent, the remainder consisting of variable amounts of ash which is chiefly composed of iron, silica and earthy matters.

	Normal graphite	Ceylon picked
Carbon	80 per cent	99.8 per cent
Ash	16 per cent	.1 per cent
Volatile products	4 per cent	.1 per cent

In commercial samples the ferric oxide which constitutes the larger portion of the ash is removed by digesting with sulphuric acid. The graphite is then ground, sifted, kneaded and left for some little time to "temper." The chief metallurgical application of graphite is in the manufacture of plumbago crucibles which contain from 25 to 50 per cent of this material, the remainder consisting of mixtures of various fire clays. These crucibles or "pots" as they are technically termed, are in contrast with clay ones very durable. After careful annealing they will stand repeated reheating and cooling. Used to a limited extent in steel-melting practice these crucibles find their chief field in the production of bronze, brass and various industrial alloys.

Basic Materials.

Infusible bodies strongly basic in character come under this heading, chief of which are bauxite, lime, dolomite and magnesia. The basic property of these materials is taken advantage of in certain steel-making processes to abstract the phosphoric acid from the iron, forming slags of stable phosphates.

Lime, in the absence of an acid such as silica is one of the most refractory substances known, being practically infusible. Crucibles of lime are used for the fusion of platinum. Owing to its tendency to become hydrated and consequently to disintegrate, lime cannot be extensively used in furnace construction and when used at all the operations must be continuous. Magnesia is extremely refractory and crucibles or bricks of this material resist high temperatures very successfully, but on account of its high initial cost it does not meet with very extensive adoption.

Magnesite, the carbonate of magnesia, is used as a source of that material. Its composition when pure is: Magnesia, 48.73 per cent; carbonic acid, 51.27 per cent. But it may contain in addition more or less lime, silicates of iron and free silica.

Dolomite, or magnesium limestone, is a double carbonate of lime and magnesia and in a pure state consists of: Carbonate of lime, 54.35 per cent; carbonate of magnesia, 45.65 per cent. In less pure forms it is found associated with more or less iron, manganese and silica. The latter, if not in excess, plays a not unimportant part in adapting the material to furnace requirements. Dolomite lacks coherence and to overcome this defect in the manufacture of brick the silica occurring with, or purposely added to, the dolomite in small quantities is fused, while the bricks are being fired, at a high temperature into a silicate forming a "frit" which binds the whole together. Dolomite before being made into brick must be calcined at a high temperature. It is then ground and mixed with anhydrous tar which binds the mass together whilst being pressed into shape, and until the bricks are fired. They may afterwards be protected from atmospheric influences by a coating of tar. For lining the beds of furnaces the calcined and powdered dolomite again mixed with tar to give the necessary consistency is rammed to the requisite shape. This bed is gently heated to drive off the tar and the surface fused over as in the case of the brick.

The aluminates of iron are very infusible and of these bauxite, a hydrated ferric aluminate, is the most representative. Owing to its capacity for resisting the action of metallic oxides bauxite is somewhat extensively used for lining the beds of basic open-hearth furnaces and is applied in a similar manner to dolomite. Its composition varies as follows:

Alumina	50 to 60 per cent
Ferric oxide	10 to 25 per cent
Silica	3 to 5 per cent
Water	10 to 15 per cent

Some varieties of bauxite give better working results when mixed with about 3 per cent of clay and with from 2 to 6 per cent plumbago.

From this necessarily brief survey of an important matter it will be seen that the refractory materials of nature, though bountifully dispersed, require more or less mechanical treatment to bring them within industrial conditions. It is to this mechanical treatment and chemical knowledge of the materials handled, combined with an exact estimate of the particular duty a furnace may have to perform, that the furnace builder must look if he wishes his structures to yield the maximum output.

A call for the annual convention of the Amalgamated Association of Iron, Steel and Tin Workers of America has been issued. It will be held at Wheeling, W. Va., on April 15. As programs must be furnished to sub-lodges six weeks before the convention meets, all suggestions to be incorporated in the program must be in the hands of the secretary-treasurer of the association before Feb. 17. That there is some friction among the lodges of the association is indicated in the call which states that a few lodges have failed to pay the assessment levied for the support of the men who suffered during the strike. The seats of delegates to be sent by these lodges will be contested in convention.

The Pittsburg Steel Shafting Co., of Pittsburg, has opened a branch warehouse at Toledo, O., with O. S. Potter in charge. A full line of hangers, pulleys and shafting will be carried in stock.

THE WESTERN MACHINERY MARKET.

Chicago, Jan. 20.—From all branches of the machinery manufacturing trade, come reports of bright prospects for the continuation during the present year of the excellent trade that marked last year. The fuel famine is a serious drawback at the present time, necessitating as it has, the withdrawal of many thousand tons of pig iron from this market, which shortage has been seriously felt by the various foundries and machine tool manufacturers in this locality. This, however, is gradually being overcome, and in a few weeks, it is hoped, the trouble will have been eliminated entirely. Nine-tenths of the concerns, from whom we have heard, report that they have orders on their books sufficient to keep their respective plants in operation several months if another order is not taken.

The Standard Pneumatic Tool Co., Aurora, Ill., states that the business done during the past year was 100 per cent greater than that of the preceding year, and that it is necessary to again enlarge its plant. There was a noticeable increase in the use of "Little Giant" pneumatic tools in the Pittsburg district, especially among foundries, iron and steel and bridge works, and there is every indication that there will be a proportionate increase during the present year in all lines. So great has grown the foreign demand for these tools that the company has decided to establish a works in Germany to supply the European demand. Plans have been drawn and machinery is now being purchased for this plant, and it is hoped the works will be in operation shortly. W. W. Tew, formerly connected with the Brooks Locomotive Works, and later with the mechanical department of the Chicago & Northwestern Railway, has been appointed managing director of the German branch, with headquarters at Klosterstrasse, 13-15a, Berlin.

Bignall & Keeler Mfg. Co., Edwardsville, Ill., manufacturer of pipe threading and cutting machines, emery surfacers, etc., reports that it has several months' work on its books, and that new business is in satisfactory volume. The year just closed was a very prosperous one, and the prospects for a continuation of this condition are bright.

J. H. Dawson Machinery Co., 39-41 S. Canal street, Chicago, manufacturer and dealer in iron and brass working machinery, has leased the two upper floors of the building in which it is located, in order to accommodate the large stock of new and second-hand machinery it is carrying. The company is now representing Schumacher & Boye, Cincinnati, and is carrying in stock a full line of this company's lathes. It recently sold to the Olds Motor Works, Detroit and Lansing, Mich., complete shop equipments for the two new factories in these cities, now under construction, and to the Fisher Machine Works, Leavenworth, Kans., a 16-foot swing lathe. "Pick-up" business has been remarkably good, indicating the establishment of new shops and the improvement of old ones.

Chisholm, Boyd & White, 57th and Wallace streets, Chicago, manufacturers of brick and briquetting machinery, reports a large increase in the number of Boyd brick and ore presses sold in the last year, many of which went to foreign countries. There is a growing interest among blast furnace managers in the briquetting machine, known as the improved White mineral press, for briquetting Mesabi ores and flue dust.

Vilter Mfg. Co., Milwaukee, Wis., builder of ice making and refrigerating machinery, Corliss engines, etc., shipped a few weeks ago, six cars of ice machinery to the Philippine Islands. The company has many orders on hand, necessitating the operation of its plant day and night.

The Goodman Mfg. Co., 48th place and Halsted street, Chicago, manufacturer of electrical mining machinery, reports that it closed the year 1901 with all departments working overtime, and from the large number of inquiries received up to that time there is an apparent intention on the part of many coal mine operators to equip their plants in the near future with electrical machinery. Probably the largest mining machinery contract ever placed by one coal company fell to this company last year, consisting of boilers, engines, complete steam equipment, with 7 electric generators, 7 locomotives and 30 coal cutting machines, with all necessary supplies. So great has grown its business that it has found its present factory facilities heavily taxed to handle all the business offered. It states that the fact that electricity as a motive power for mining purposes being the most flexible system that can be installed, is becoming more universally recognized, as indicated by the large number of contracts placed with it last year.

The Dings Electro-Magnetic Separator Co., Milwaukee, Wis., has shipped brass separating machines to the following concerns: C., B. & Q. Foundry, Aurora, Ill.; Westinghouse Air Brake Co., Wilmerding, Pa. (2); the W. D. Allen Mfg. Co., Lake St., Chicago; the Henry McShane Co., Baltimore, Md.; Buick & Sherwood Mfg. Co., Detroit, Mich.; H. B. Sherman Mfg. Co., Battle Creek, Mich.; Robt. Wetherill Co., Chester, Pa., and is building one for the government navy yards, at Puget Sound, Wash. The company's business is outgrowing its facilities, and it will shortly find it necessary to occupy larger quarters.

The Brown Corliss Engine Co., Corliss, Wis., has completed its plant in the latter town, and expects to be in operation about the middle of the month. The cranes are installed, and the power plant and machine tools are rapidly being erected.

Atlas Engine Works, Indianapolis, Ind., report there is no decline in the demand for engines, and that sales are limited only by the capacity of the works. Inquiry was much greater during the month of December than in the months immediately preceding.

The Weber Gas & Gasoline Engine Co., Kansas City, Mo., reports that among the new engines which it will put on the market this year will be a prospector's hoist of 2½ horsepower, which will be built in sections for mule pack transportation. The features of this engine, the company states, will be low cost, light weight and simplicity. Though the company greatly enlarged its plant eighteen months ago, it has found further additions necessary, and these are under construction. During the year just closed shipments have been made to Australia, New Zealand, Mexico, Norway, Northwest Territories, and to several South American countries.

Chandler & Taylor Co., Indianapolis, Ind., is completing a new line of direct connected engines, which will conform with the recommendations made by the American Society of Mechanical Engineers for units of this kind. Rapid progress is being made on the company's new plant, which will have greatly increased facilities over the present works.

H. W. Caldwell & Son Co., Western avenue and 17th street, Chicago, manufacturer of conveying, elevating and power transmitting machinery, states that prospects for the continuation of the very good business which it has enjoyed in the year just closed are very encouraging.

Sullivan Machinery Co., 135 Adams street, Chicago, manufacturer of rock drills, hoisting machinery, air compressors, etc., has recently secured the plant of the M. C. Bullock Mfg. Co., Chicago, which it is enlarging. Appreciating the rapid extension of its business in the southwest and Mexico, it has also located a branch office and supply department at El Paso, Texas.

Fred W. Wolf Co., of Chicago, manufacturer of ice making and refrigerating machinery, has secured orders for a 50-ton refrigerating and 20-ton ice making plant for McKinney, Tex.; a 180-ton refrigerating plant for New Orleans, La.; an 80-ton refrigerating and a 25-ton ice making plant for Homestead, Pa., and a 50-ton plant for Fort Wayne, Ind., in addition to apparatus for Armour & Co., Chicago, and for concerns in Bloomington, Ill.; Cedar Rapids, Ia., and Detroit, Mich.

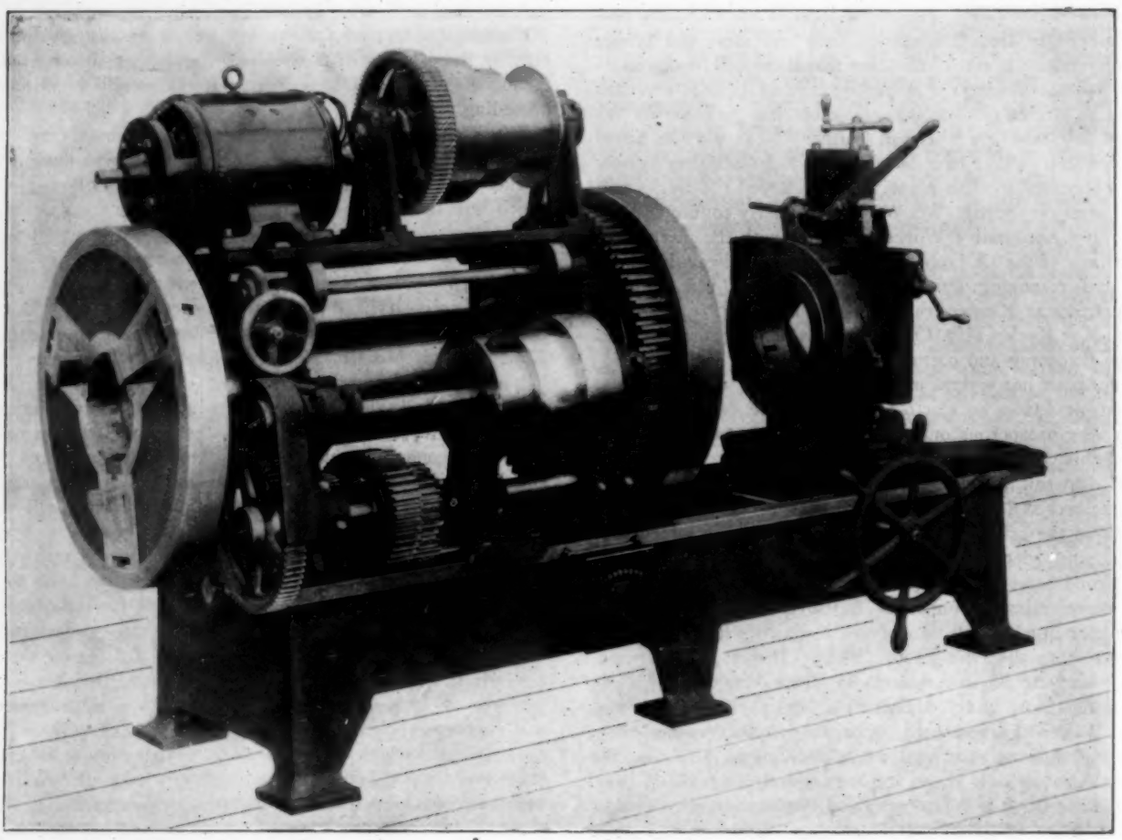
The Standard Railway Equipment Co., St. Louis, Mo., manufacturer of pneumatic tools and appliances has moved into its new works at 16th and Grand avenue, East St. Louis, Ill. The new shops have an area of 20,000 square feet, and consist of a one-story building, 18 feet high, with skylight running through the center of the building. With its increased facilities the company expects to treble its previous output. It is now about thirty days behind its orders.

The Robert Aitchison Perforated Metal Co., 303 Dearborn street, Chicago, reports among its recent orders one from New Zealand and one from Glasgow, Scotland. Extensions in its factory at South Chicago have been found necessary in the last few months, and additions have been made to the machine and die shop and a building erected for factory office. The company reports that the business last year heavily taxed the capacity of its plant, and it looks for no diminution in the present year.

AN ELECTRICALLY DRIVEN PIPE THREADING MACHINE.

The illustration shows a No. 8 Duplex improved machine, with three horsepower Bullock electric motor attached. The same design is used in equipping all the Duplex machines, which are manufactured in six sizes, having a capacity from six to eighteen inches.

The motor is placed on a table directly over the main bearings of the machine; this table also supports a countershaft, on which a three-step cone pulley and a large gear wheel is securely fastened, the motor pinion meshing directly into this gear on the countershaft. One side of the table is held by a hinged bearing, the side of the main journal cap being designed to receive this support; the other side of the table rests upon two steel cams. The cam shaft rotates in bearings on the main journal caps, and by means of worm gearing the cams may be adjusted and the table elevated or lowered accordingly. This cam movement furnishes the means for tightening the driving belt on the cone pulleys; the belt naturally becoming loose through wear and stretch in the belt or the laced joint.



ELECTRICALLY DRIVEN PIPE THREADING MACHINE.

The method of driving is exceedingly simple and very flexible in speed regulation. The controlling of motor speeds by means of resistance boxes is wasteful of electrical energy. In the present case the motor runs at a constant speed and the various changes in the velocity of the main shaft are obtained through the usual methods of the cone pulley. With three steps on each of these pulleys and the sliding gear on one of the shafts six separate speeds are obtained for the machine. The device for regulating the height of the table, and thereby adjusting the tension of the belt compensates for the short belt drive, and the arrangement becomes as effective as the ordinary long belt design. The overhead connection demands no increase of floor space, and its convenient adaptation is a very desirable feature where there are no multiple-voltage or other systems allowing the speed of the motor to be accurately and economically controlled.

This line of pipe-threading machinery is manufactured by the Bignall & Keeler Mfg. Co., Edwardsville, Ill.

The 20-inch bar mill of the Highland Iron & Steel Co., Terre Haute, Ind., was placed in operation last week. The entire new plant of this company is now in operation.

PRODUCTION OF METALS IN THE UNITED STATES IN 1900.

From the Mineral Resources division of the United Geological Survey, Dr. David T. Day, chief of division, we have the following review of the Mineral Resources volume for 1900 which has just been published:

"Every chapter in this report is a census of the productive features of the industry, as complete as possible with the means at command." That sentence from the Introduction by Dr. Day gives the keynote of the whole report. The figures are obtained directly from the producers themselves; much information has been added by many local experts; and the technical press has furnished prices, market reports, new technical processes, and new mining enterprises. That is to say, the whole ground has been covered with scientific precision and accuracy.

In 1900, for the first time, the value of our mineral products passed the billion dollar mark. That is a great saying in little compass. The exact figures are $1,067,605,587, a gain of $95,704,693 or 9.85 per cent over 1899. This gain is much less actually and proportionately, than the gain of 1899 over 1898, which was 39.20 per cent; but it is more than three times the normal growth of the mineral industries from 1880 to 1898, and shows that those industries kept pace with the national prosperity in 1900.

Iron and coal, as heretofore, are the most important of our mineral products, the value of iron in 1900 being $259,944,000, and of coal $306,891,364—an aggregate of $566,834,364, or more than half of the total production. Nearly all the important minerals increased in output during the year, though copper increased in product and declined in value, and zinc declined in both product and value. Every variety of fuel increased except anthracite coal, which declined from 1899 over 2,700,000 long tons. The total value of the fuel in 1900 was $406,250,518, a gain of 19.22 per cent over 1899. The average price of anthracite coal per ton at the mine in 1900 was $1.49, 3 cents more than in 1899; and the average price of bituminous coal was $1, or 13 cents more than in 1899.

Iron and Steel.

At the beginning of the last century comparatively little

iron and steel were made in any country; there was little demand for them. Then came the railroads, beginning in 1825; then came the street railways in 1832; then iron and steel bridges; then iron and steel steamboats; then steel frames for large buildings; last, steel freight cars; and along with all these a constantly increasing use of iron and steel for machinery, pipe, hardware, stoves, shovels, and a thousand and one other articles. The last year of the first quarter of the century witnessed only the beginning of this huge development; the last few years of the last quarter alone have seen its ripest fruits.

The invention of the Bessemer process in 1855 and 1856 made the great railroad extension possible; with its companion, the Siemens open-hearth process, dating from 1864, it has made steel bridges, buildings, ships, and cars possible. Beginning with the use of the hot blast by William Henry, at Oxford Furnace in New Jersey, in 1834, the modern blast furnace has made the application on a large of these steel-making processes possible. And nature has made the whole development possible. No other country possesses in such abundance as the United States the necessary raw materials; and no other country has produced a more skillful class of iron and steel makers than our own. Back of it all is chemistry, that science which in 75 years, has changed the face of western civilization and shown that the philosopher's stone is really iron ore.

The record-breaking output of pig iron in 1899 was, contrary to expectation, exceeded in 1900 both in quantity and in value. The gain of 1899 over 1898 was prodigious and was recognized as the result of abnormal conditions, which could not last; nevertheless, 1899 was surpassed by 1900. The average price also of pig iron increased from $18 in 1899 to $18.85 in 1900, almost reaching the maximum of $19 attained in 1887. Although the production of Bessemer steel ingots decreased, the production of open-hearth steel increased, as did also the production of Bessemer steel rails, and their average price at the works was $32.29 in 1900 against $28.12 in 1899. Our total imports of iron and steel in 1900 amounted in foreign value to $20,443,908, whereas our total exports of iron and steel in 1900 including locomotives, car wheels, machinery, etc., amounted to $129,633,480 against $105,690,047 in 1899, $82,771,550 in 1898, and $62,737,250 in 1897. Our exports of iron and steel have more than doubled in value in the last four years. These exports do not include agricultural implements, whose exports amounted to $15,979,909—a value more than threefold what it was five years ago. The United States produced 34 per cent of the total world's production of pig iron in 1900, and over 37 per cent of the world's production of steel.

Iron Ores.

Our production of iron ore in 1898, 1899 and 1900 has never been equalled by any other country, the nearest approach to our output being made by the German empire in 1900, when it produced 18,667,950 long tons; and yet this nearest approach was about 2,000,000 tons less than the output of the Lake Superior region in 1900, and more than 4,000,000 tons less than the output of 1900 of red hematite ore alone. Our total production of iron ore increased to 27,553,161 long tons, an increase of 12 per cent over 1899, and their value went by a great leap to $66,590,500, or 90.26 per cent over the value of 1899. The number of tons produced in 1900 was 42 per cent greater than in 1898, a marvelous record.

The best of it is that the bulk of the iron ore mined in this country is used in the production of pig iron in this country. From 1889 to 1900, inclusive, the production of iron ore was 206,060,395 long tons, an average of 17,171,700 tons per annum, and the production of pig iron was 114,931,099 long tons, an average of 9,577,592 tons per annum—an apparent average yield of domestic ore of 55.78 per cent, which is, however, too high.

The Lake Superior region, embracing iron ore mines, chiefly red hematite, in Michigan, Minnesota, and Wisconsin, produced in 1900 its maximum output of 20,564,238 long tons, 75 per cent of the total for the United States, more than was mined in the whole country in any previous year except 1899; and of this enormous output the Mesabi range alone, in Minnesota, produced 8,158,450 long tons, or 30 per cent of the total output of the country. Minnesota is the largest producer of red hematite, followed closely by Michigan, with Alabama third. The iron ores of the Lake Superior region reach their destinations cheaply by means of the long water haul. The total shipments in 1900 were 19,059,393 long tons, over 11,000,000 long tons coming from the three lake ports of Two Harbors and Duluth, in Minnesota, and Escanaba in Michigan. About 2,700,000 tons went to Chicago furnaces and furnaces in Michigan and Wisconsin. Of about 15,800,000 long tons transported to the lower lakes, over 9,600,000 tons were received at the three ports of Ashtabula, Cleveland, and Conneaut in Ohio. Only 489,078 tons were forwarded by rail.

In the order of production of iron ores down to less than 500,000 tons the States rank as follows: Michigan, Minnesota, Alabama, Virginia and West Virginia, Pennsylvania, Wisconsin, Tennessee. The total value at the mines of the iron ore produced in 1900 yielded an average of $2.42 per long ton, an increase of $1 per ton or 70.4 per cent over the 1899 value of $1.42 per ton. The lowest average value reported per ton was 82 cents in Texas, where convict labor is used in some mines; the highest was $3.71 in Colorado. The stocks of ore reported on hand at the mines on December 31, 1900, was 60 per cent over the total of 1899. In 1900, 110 mining operations produced 88.3 per cent of the total output of iron ore. Three of these operations contributed over 1,000,000 each. Of these mining operations, 42 are in Michigan, 31 in Minnesota, 10 in Alabama, 6 in Wisconsin, 4 each in New York and Colorado, 3 each in Tennessee, New Jersey and Colorado, 2 in Pennsylvania and 1 each in Georgia and Wyoming.

The total imports from ores in 1900 was 897,801 long tons, valued at $1,303,196, or $1.45 per ton, at the port of shipment, an increase of 33.2 per cent over 1899. Cuba was the largest foreign contributor with 444,977 long tons; Spain comes next; and Newfoundland and Labrador third. Of the imports Baltimore received 448,660 tons, and Philadelphia 414,064 tons. The exports, chiefly of Lake Superior ores and chiefly to Canada, amounted to 51,460 long tons, valued at $154,756.

Copper.

The production of copper increased 16.59 per cent over 1899, but the value declined 2.7 per cent. The average price per pound of copper in 1900 was 16.25 cents against 17.8 cents in 1899 and 11.75 cents in 1898. Some of the leading producers mined less metal than in former years, while other producers largely increased their output. There was great activity in opening old mines and in the development of new properties; but few of them became productive in 1900. This activity was marked in the Lake Superior region, in Montana, and in Arizona, the three great copper producing sections of the country, and also in Utah, New Mexico, Wyoming, California, Tennessee and Vermont. The copper exports in 1900 were valued at a little over $58,800,000 as against about $43,500,000 in 1899; the imports were valued at $15,449,779 against $11,054,274 in 1899.

Lead.

The condition of the lead industry in 1900 seemed to be deplorably unsound. The increase was unprecedented, nearly 30 per cent, with an increase in value from nearly $19,000,000 in 1899 to about $23,500,000 in 1900. This sudden rise cannot, however, be regarded as either normal or safe, being the results apparently of consolidation of mines and of artificial stimulation of prices. There is reason to believe that consumption failed to keep pace with increased supply, and that important accumulations of the metal were unmarketed during the year. This is to be deplored. Our lead is produced, first, from the non-argentiferous ores of southeastern Missouri; second, from the zinc-lead mines of the Joplin-Galena district in southwestern Missouri and southeastern Kansas; third, by far the greatest majority of lead is obtained by smelting ("desilverizing") argentiferous lead ores mined in the Rocky Mountain region. In 1886 imported argentiferous lead ores from Mexico and British Columbia began to furnish considerable amounts of lead. Later on refining in bond of foreign base bullion became an important industry. The market price of lead in 1900 varied rapidly and capriciously, so far as could be seen. From August 27, 1900, to the close of the year it remained at 4⅜ cents per pound.

Zinc.

During 1900 the production of zinc in the United States,

123,886 short tons, declined 4 per cent in amount and 28.2 per cent in value, as compared with 1899. The average realized price of zinc per short ton in 1900 was $26.50 against $28.50 in 1899 and $28.44 in 1898. There was a large loss in production in Illinois, Indiana, and Missouri, and a large gain in Kansas. The decline in Illinois was due largely to strikes. The indications are for an increased production in 1901. The exports of zinc in 1900 were $3,450,644, more than double the exports of either 1899 or 1898. Those in a position to know predict that our exports of metal will soon take the place of the present exports of zinc ores.

Gold.

The most important gains in gold production were in the Seward Peninsula of Alaska, the Cripple Creek district of Colorado, and the territory of Alaska. The Cape Nome beach claims are found where streams empty, or have emptied in times past into the ocean, bringing gold from the placers above. This general territory, about 350 miles long and 100 miles wide, yielded in 1900, $5,100,000 in gold. Colorado gained $2,846,600 over 1899, the Cripple Creek district supplying nearly the whole gain. The reserves in sight in this district are enormous. The tendency to consolidate in the Cripple Creek properties has been very great. Arizona nearly doubled her production in 1901 over 1899, and the discoveries reported promise a growing future output.

Silver.

The yield of silver in the United States in 1900 shows an increase of nearly 3,000,000 ounces over 1899, and has been exceeded in but three years, 1891, 1892 and 1893. And yet the Director of the Mint assures us that two-thirds of the output of silver in the United States is obtained as a by-product from mines which will be operated no matter what the price of silver might be. Thus Colorado produced over 20,000,000 ounces, of which 16,000,000 was from lead and copper ores; and Montana produced over 14,000,000 ounces of which over 11,000,000 ounces were also from lead and copper ores. The quicksilver production declined in 1900 about $150,000 in value as compared with 1899. Except 265 flasks from Oregon in 1887 and 1900 and 2,800 flasks from Texas in 1899 and 1900, the total production was from California.

Manganese Ores.

The production of manganese ores amounted to 11,771 long tons in 1900, valued at $100,289, the average price per ton being $8.52 against $8.28 in 1899. Virginia and Georgia produced 96 per cent of the total amount. The bulk of the manganese ores used by the steel companies in 1900 came from foreign countries, Russia, Brazil, India, Turkey, Spain, Chile, etc. Russia was the largest producer and Spain the next. The imports were valued at $2,540,361 or $7.97 per ton as against $8.41 per ton in 1899. Russia contributed over half of the importation, Brazil and Cuba coming next.

Nickel.

The nickel deposits in Oregon continue to attract attention and efforts are being made to develop them. Nickel has been found near Sedro and Woolley in Washington, also near Mt. Idaho, Idaho. This country looks to Sudbury, Ontario, for its supply of nickel, and if the export duty recently authorized by the Canadian Parliament be put in operation, it will powerfully stimulate the development of nickel deposits in the United States.

Platinum.

As a result of a thorough examination made by Dr. David T. Day, platinum has been shown to occur in small quantities at many of the placer mines in California and Oregon, and at a few placers in Idaho, Montana and Alaska. Chromite is nearly always found associated with platinum, hence it is not improbable that platinum will be found in the basic magnesian formations of California and Oregon, and also of North Carolina, Georgia, Maryland and Pennsylvania.

A booklet entitled, "56 Points of Vantage," has been published by the Bickford Drill & Tool Co. of Cincinnati, in connection with its new line of radial drills, and in it the general design of drilling machinery as well as the proper speeds and feeds of tools used are discussed.

NEW BOOKS.

POWER AND POWER TRANSMISSION: A treatise upon elementary engineering. By E. W. Kerr, M. E. First edition. 8vo, xii+356 pages, 264 figures. Cloth, $2. Published by John Wiley & Sons, New York.

The material contained in the book is largely the subject-matter of lectures delivered by the author to students of the elementary principles of engineering at the Agricultural and Mechanical College of Texas. Frequent recourse has been had to the various works treating upon machinery and mechanics, steam power, pumps, gas engines, water power, compressed air and hot-air engines. Much of the material is not new and is not claimed to be original with the author, who follows the commendable plan of crediting his sources of information. The student is therefore enabled to use the information as the foundation for further and more thorough investigation, either in the class room or elsewhere. Each of the chapters has a number of problems for the purpose of fixing in the mind of the student the more important principles contained; these are not given as examples of practice, though the author says that many of them belong to this class. The practical quality of problems in mechanics is at once instructive and attractive to the worker in this field of study and the avoidance of puzzles should be a predominant feature of works of this class now. The author does not give solutions to the problems, but this does not impair the purpose of issuing them as specific illustrations of the more general statements brought out in the body of the text. Opinions differ regarding the value of printing answers to problems in a text book. There are some things the reader should establish for himself. In class work the instructor should supply the step if the student cannot find it, and as the book is intended for this purpose as well as individual use, there is good reason for this omission. The book contains an excellent index and is printed clearly on good paper.

CAST IRON: A Record of Original Research. By Wm. J. Keep. Detroit, Mich. New York: John Wiley & Sons. 225 pages, 6x9 inches. Price, $2 50.

Mr. Keep's original work in the field of cast iron is well known, and this volume was undertaken with the purpose of gathering into permanent form the results of investigations extending over more than fifteen years. The preface notes that in 1885 the author discovered a relation between shrinkage and the composition of a foundry mixture. Later, following the publication of Professor Turner's discovery that the condition of carbon depends upon the property of silicon, he developed the fact that shrinkage varies inversely as silicon. "Keep's test" was the outgrowth of experiments founded on silicon and shrinkage variations. Then came the work of the testing committee of the American Society of Mechanical Engineers, and later the American Foundrymen's Association testing investigation, which resulted in an elaborate report already printed in these columns. Mr. Keep makes use in his book of the tensile and compression tests of this committee to supplement the transverse tests of his own committee. Early in the volume Mr. Keep gives the following summation of his system of regulating a foundry mixture:

"Measure the shrinkage of a ½-inch square test bar from your iron mixture when you consider it satisfactory, and use it for your standard. For stove plate and small castings it will be .115 to .140; for ordinary machinery castings, .150 to .160. If the shrinkage is greater than your standard use more soft iron (increase silicon). If it is less use more scrap or cheap iron. The strength of a ½-inch square test bar should be above 400 lbs.

"With high shrinkage and high strength of a ½-inch test bar heavy castings will be strong, but castings ⅜-inch thick may be brittle. With low shrinkage and high strength of a ½-inch square test bar large castings will be weak and thin castings will be strong. With uniform shrinkage an increase in the strength of a ½-inch square test bar will increase the strength of all castings proportionately. For ordinary foundry work, and for all irons that will run gray in a ½-inch test bar that size gives better results than any other."

It will be noticed that Mr. Keep has not modified his early views on the ½-inch square test bar. His well known views as to the relative value of chemical analysis and "mechanical analysis" to the average foundryman are reiterated in the volume before us, two chapters being devoted specifically to this subject. The bulk of the work is devoted to the influence of the various elements upon the strength, shrinkage and hardness of cast iron.

"EXPERT" OPINION WITH PUBLICITY ON EASY TERMS.

The operations of the *Southern Review*, of Cincinnati, which ostensibly sends out a corps of "experts" to examine into the relative merits of various products, and then submits the "report" of its experts to the firm whose product carries off the palm, has been referred to in the trade press from time to time. The peculiarity of these expert opinions is that they are worded almost precisely alike, the chief difference being in the name of the product, which is presumably inserted in a blank in the "form" letter which goes to the fortunate manufacturer of the "best" article in his particular line. There is an invariable accompaniment of this "report" as it goes out, and that is a letter saying that there is no charge of any kind for the report, but that if the firm addressed would like extra copies of the paper containing it they can be had for a consideration.

A near relative of the *Southern Review*, possibly near enough to be published in the same office, is the "United States Trade Reports." The method of operation is seen in the following letter recently sent to a leading iron and steel company :

CINCINNATI, O., Dec. 14, 1901.

——— ——— ———

Pittsburg, Pa.

Gentlemen : The sheet we enclose is a copy of an article we have prepared in answer to correspondents, which we intend to publish in the "United States Trade Reports" as an editorial, giving our unprejudiced opinion on this subject. After we had obtained the facts we wrote the editorial and set it in type, intending to publish it in this week's issue, but on further consideration we concluded that there might be some error or oversight in it, and so decided to submit the copy to you for your opinion, and hold it over till next issue. Kindly co-operate with us, and add to it or alter it as you may desire, as our one object is to have a comprehensive article; correctness being a necessity, it going in our editorial columns. If you will send us any cuts (half-tones preferred) we shall be pleased to illustrate with same.

This editorial being ours, we, of course, do not charge for same in any way, either directly or indirectly. We need hardly say that if you will use some of the copies of the issue in which it will appear, for your own benefit, we shall appreciate an order. The price of the "United States Trade Reports" is 15 cents per copy, but we can supply you with 100 at 12 cents; 250 at 10 cents; 500 at 9 cents; or 1,000 or over at 8 cents per copy. We can either send you any number you want, or we will mail them for you to any names you may send us, or to those we know will be interested. State whether you wish us to mark the article so as to draw direct attention to it.

Trusting this will be but the beginning of a pleasant and mutually profitable business connection, awaiting your reply we are Yours very truly,

UNITED STATES TRADE REPORTS.

The article enclosed was as follows :

"STONE AND MARBLE SAW BLADES OF UNEQUALED QUALITY.

"In the course of a year we are called upon to look up information upon almost every subject. The manufacturer, the architect, the merchant, some of the many railroad companies, and others, all are desirous of obtaining some information that will further promote their interest or increase their knowledge upon this or that particular matter. We have recently received several inquiries from quarrymen, asking us to give our recommendation, and openly expressed opinion, as to what concern manufactured the best stone and marble saw blades. To intelligently reply to these requests we secured the services of several thoroughly reliable experts and had them to prosecute to completion a thorough investigation of the entire field of this production.

"This investigation, which consumed a considerable period of time, has just been completed, and we submit to our readers their reports which follow. We find in summing up their reports that all were a unit in favor of the quick cut blades manufactured by the ——— ——— ———of Pittsburg, Pa. Their marble and stone saw blades have not only withstood the most exacting tests and examinations required by experts, but have also withstood that more practical test, actual use, and their superior efficiency, durability, quality and finish are unequaled. This company are the largest manufacturers of this kind in the United States and are well known to the trade for their superior production. Their plant is equipped with all the latest and most modern machinery and appliances which give them an immense output, and having the best of shipping facilities they are in a position to fill all their orders with promptness and dispatch. The extreme care they take with all their orders, whether large or small, the skilled mechanics they employ, the painstaking supervision they make of all their work before placing it with the trade, and the materials used, are conclusive evidence that we have made no mistake in making a recommendation in these premises. We take pleasure in recommending the quick cut saw blades to our readers, and advise them to communicate with this company for any further details and information that may be desired. We disclaim any desire to advertise the above named company, and most positively assert that this recommendation is the expression of a conviction born of the acquisition of facts, and is made for the sole benefit of our inquirers who have requested the information."

It is hardly necessary to characterize the Cincinnati concern, nor to say that iron and steel and machinery manufacturers have not been induced to invest any large share of their profits in this form of advertising. Ordinarily the manufacture and sale of iron and steel is a sober business, but apparently it has its humors.

Railroad Expansion and the Iron Industry.

Some figures concerning the Baltimore & Ohio Railroad Co.'s track laying operations since 1896 give a good gauge of the process of re-making railroad properties that has been going on since the first election of Wm. McKinley. Its relation to the expansion of the iron industry in the same period is obvious. When the Baltimore & Ohio railroad went into the hands of a receiver, in March, 1896, there were few rails in the tracks heavier than 70 pounds to the yard. All of the light rails have been removed from the main line of the road and put in side-tracks and on the smaller branch lines, and have been replaced by rails weighing 85 to 100 pounds per yard. For the past six years the rail purchases of the company have been as follows: 1896, 22,098 tons; 1897, 31,547 tons; 1898, 35,197 tons; 1899, 75,618 tons; 1900, 71,955 tons, and 1901, 40,651 tons. Aside from the necessary expenditures to keep the road in operation the company has been spending on an average $15,000,000 per year for the past six years. New bridges have been built and old bridges strengthened to carry the increased weight of the new equipment which has been purchased; grades have been reduced and curves eliminated where possible; single track has been supplanted by double track; the main line of the road has been re-ballasted from end to end, and new wharves, storage houses and grain elevators have been constructed to take care of the constantly growing traffic. On the Pittsburg division alone $1,438,856 was expended in betterments last year and as much or more is to be spent this year. Since 1896 the mileage, exclusive of yard tracks, sidings, second tracks has been increased from 2,096 to 4,357 miles.

In a statement to its stockholders the Republic Iron & Steel Co., under the date of Jan. 2, says: "We are pleased to be able to inform you that since the beginning of this fiscal year the earnings of the company have been in excess of the requirements for the payment of the preference dividend. As soon as possible after the receipt of the reports from the various plants for the month of December, we shall send to our stockholders a statement of the earnings and condition of the company up to Jan. 1, 1902."

A manufacturing plant will be erected in Cleveland by the Chicago-Cleveland Car Roofing Co. The building will be 100 feed wide and 325 feet long, and will be one story high. It will cost about $25,000.

The McCormick Harvesting Machine Co., Chicago, is preparing to ship from Philadelphia a consignment of 450 carloads of harvesting machinery to Russia. Three steamships have been chartered to convey the cargo.

Premium Plan of Rewarding Labor.*

BY. H. M. NORRIS.

My experience with the premium plan dates from the early part of 1899, when I introduced the system into the works of the Bickford Drill & Tool Co., Cincinnati, O. The workmen I had to deal with were almost all union men, opposed to piece work, and their attitude—particularly that of the union to which they belonged—soon developed into a factor of far more serious importance than I had reckoned for. This attitude is perhaps best evidenced by the action of the Internation Association of Machinists at their convention held at Buffalo in May, 1899. A few weeks prior to this convention during a discussion with Mr. James O'Connell, Grand Master, International Association of Machinists, concerning the introduction of the premium plan and a threat to strike therefrom, I presented the following conditions under which employes of the Bickford Drill & Tool Co. would be expected to work faithfully and conscientiously:

Premium Plan Conditions.

1. That each employe shall be guaranteed his regular day's work wages so long as he shall remain in the employ of the Bickford Drill & Tool Co.

2. That the time limits shall never be lower than the best time made with the same tools under the day's work plan.

3. That no one shall be discharged because of failure to reduce his time below the limits.

4. That, in addition to his regular wages, each employe shall be paid one-half his regular hourly rate, less any fraction of a cent, for each and every hour he may reduce his time below the prescribed limits.

5. That a limit once fixed shall not be lowered, except through the introduction of new methods of doing the work.

6. That all premiums shall be paid within two weeks of the completion of the work upon which they were earned.

7. That at the end of one year's time the system will be withdrawn from all those not wishing to continue working under it.

8. That, if withdrawn, the employes shall not be required to work at the same rate of speed without an equivalent in wages.

These conditions Mr. O'Connell expressed himself as satisfied with, and promised to present at the coming convention, and they were presented, with, however, the following added conditions:

9. Any member of the I. A. of M. working at the premium work system shall not be permitted to earn more than 10 per cent in excess of the average wage paid in that locality. A shop committee shall ascertain each pay day the amount earned by each member under the premium work system. All over 10 per cent he may earn shall be forfeited to the lodge of which he is a member, and reported to the financial secretary of the lodge.

10. No member of the I. A. of M. shall be permitted to run two or more machines except where an agreement has been entered into with organization and the firm. Such agreement shall only apply to special machines and shall require all machinists to be members of the I. A. of M.

It was moved at the convention that under these ten conditions members of the I. A. of M. should be at liberty to accept premium work. The motion was stormily rejected, on the grounds, speaking broadly, that the American workman does not need an incentive—goad they call it—to do a fair day's work. Without attempting to go into the details of the discussion that followed, it is necessary to say here that there was a decided and almost unanimous tendency on the part of those who spoke to confound premium work with piece work.

The claim that the American workman needs no incentive is surely a very lame one. Necessity for a proper incentive is the very root and cause of the premium plan. It has been said that if man's stomach ceased to call for food and his body for raiment and shelter, all work would immediately stop and man would simply lie around, a breathing mass, for lack of incentive in one form or another—often in the form of healthful rivalry; we are all naturally anxious to win as much as possible. Take away from the schoolboy the winning feature of the game of football and for lack of incentive he will cease to play football or at best, will play it in but a half-hearted manner. Take away from your salaried selling agent the winning feature of his work—commission—and for lack of incentive he will lose many a sale he would otherwise win.

Now, if a commission on sales is a healthful incentive to the salaried selling agent—and it certainly is—why not a premium on time to the salaried craftsman? One sells, the other makes; they both work, and the more both do the more they both ought to earn.

The eight conditions already cited which governed my introduction of the premium plan form in themselves a fairly clear outline of the system. The first condition is that each employe shall be guaranteed his regular day's work wages. At first sight this would not appear to need any explanation, but as the same condition may obtain under the piece work system, it is necessary to say that whereas under the latter all losses are generally charged against the employe and deducted from future winnings, there cannot be any losses under the premium plan; the workman cannot run into debt and be discouraged by the knowledge that until the debt is wiped out future winnings do not count; he can only gain.

The second condition is that the time limits shall never be lower than the average time made with the same tools under the day's work plan. This means that the employer must, for a considerable period before introducing the system, make records of times actually occupied under ordinary working conditions, and then use the average as the time limit.

Conditions 4 and 5 are, "That, in addition to his regular wages, each employe shall be paid one-half of his regular hourly rate, for each and every hour he may reduce his time below the prescribed limits," and "That the limits once fixed shall not be lowered except through the introduction of new methods of doing the work." Any attempt to introduce the premium plan on conditions less generous than these will fail. The employer must be absolutely honest of purpose; there must be no attempt to reduce a time limit after once it has been fixed. Workmen have not forgotten that under the piece work system employers reduced piece prices, and they fear a similar cutting of time limits. Piece rates had to be cut—it is one of the faults of that system—but under the premium plan the employer pledges himself to share the value of all time that the workman can save over that previously occupied under ordinary day work conditions, and he must either abide by this pledge or abandon all idea of success with the premium plan.

Introduction of the System.

When, in the early part of 1899, I decided to introduce the system I began making a card index of comparative statistics, showing the time consumed in the past on each operation of our standard line of production. When the indexing had progressed sufficiently to enable me to commence operations, I went to one of our oldest men, spoke with approval of his time on a recent lot of sleeves (16 hours, 43 minutes) and told him the shop would, of course, be glad of any possible further reduction of time, and at the same time would like to see him share in the advantage. I proposed, therefore, to split his wages on every hour he could save under seventeen hours. His answer—that it would suit him all right, but he wanted no piece work—gave me an opportunity to explain to him that it was not piece work, but the premium plan, aiming at division of savings and unification of interests; in any case, it was not compulsory and could be dropped at any time.

The man looked skeptical, and as though he were but half convinced. Still he tried it, with the result shown on the ticket in Fig. 1:

PREMIUM TICKET SHOWING EARNINGS OF JOHN SMITH.—No. 52, Tool No. 214.

On Turning, Boring and Facing.
6 pieces. Marked 11 A 3. For Piece Order No. 5215.

*A stenographic report of paper and discussion before the Engine Builders' Association, as it appears in the *Engineer*, of Cleveland, Jan. 2, 1902.

FIG 1.

Time.	Hours.	Date.		Remarks.
Commenced.....	10	7-24-99		
Finished	10:30	8-3-99		
Time limit.....	102	Rate Earnings		
Actual time.....	88½	28	24 78	
Premium	13½	14	1 89	
Labor cost of work.....		.. ..	26.67	
Labor cost per piece				
Inspected.....				

By Foreman. Read notes on reverse side.

I then approached a number of the others, and in the course of time had most of our leading hands working under it.

Thus encouraged, I brought out the ticket just referred to, the back of which read:

NOTICE.

"It is the purpose of the management of this company to compensate its employes according to their individual ability to turn out good work at minimum cost, and in order that this may be done by a system that will not in any way endanger the present scale of wages, it has been decided to adopt the premium plan. Under this system each workman is assured his regular "going rate," whilst being afforded an opportunity of earning a substantial bonus on all work which he completes within the specified time set by the office. Tables have been prepared showing the average time consumed in the past in the performance of each operation on the several parts of our standard machines. These averages will be regarded as representing the minimum time within which the work must be completed in order to entitle the workman to a premium. It will not be difficult, therefore, for any one to add something to his earnings, the amount of increase depending solely upon the individual effort of the workman. There is no risk of loss, but every opportunity for gain. A time limit once fixed will not be changed, except through the introduction of new methods of doing the work, so there need be no fear of earning too much money. Those who earn the most will be worth the most.

"This slip shows on the reverse side the amount earned by you on the work indicated in the heading. The rate per hour at which premiums are figured vary according to the going rate of the workman, a schedule of which is given below

Rates.	Prem.	Rates.	Prem.	Rates.	Prem
5-11	5	16-17	8	22-23	11
12-13	6	18-19	9	24-25	12
14-15	7	20-21	10	26-27	13

"The conditions governing the payment of premiums are as follows:

"Premium will not be paid on any work that is not completed to the entire satisfaction of the foreman.

"Every workman must assure himself before commencing a piece of work that it will finish to the required size, whether the work is to be completed by him or others.

"No allowance can be made for bad material or deficient workmanship in any previous part of the work unless the same is pointed out to, and indorsed by, the foreman as soon as discovered.

"This slip must be carefully preserved, both for your own reference, and in order that it may be returned to the office in good condition in case of your leaving our employ.

"All premiums will be paid on the first regular pay day following the completion of the work upon which they were earned."

Opposition of Workmen.

For a time everything went smoothly, but one day a man came with a claim that a mistake had been made in the time limit on some wall radial arms. Only eighty-four hours had been allowed, while he asserted that the job had previously taken eighty-six hours. He admitted that he had made $1.40, but thought he should have made more, and remained unconvinced and unsatisfied, even after the reference to the index showed the recorded times to be eighty-six and three-quarters and eighty-two and one-half hours. His position was that the man who saved an hour should be paid for the entire hour, that piece work was better than premium work, but he did not want either of them, and would sooner go on doing as he had been doing before the innovation. I assured him he need not take the extra money—there was nothing compulsory in it.

This was the beginning of the trouble. Time commenced to go up. Instead of coming within the old records, it ran above them. The men were "soldiering." I spoke to the foreman. He said he had noticed it, and asked what I thought had better be done. I told him we would have to make an example of one of the men, but must wait until we were sure of premeditated action. Time continued rising. Something had to be done at once. We had notified each of the delinquents a number of times without avail.

"Pick out the slowest, or one you can spare the best, and let him off on Saturday," were my instructions to the foreman.

On entering the works the following Monday, I noticed several of the men at the wash troughs. Upon inquiring the cause, the foreman told me that one of the men had quit out of sympathy for the discharged employe, and that the others had followed right along after him. This was all he knew about it. He doubted if half of them knew themselves why they were leaving. Five or six others started to go out, but returned, saying they wanted to know what they were going out for before they threw up their jobs. I then sent for one of our oldest men—oldest in point of service—and asked him if he could tell me why the men had gone out so unceremoniously. He said the men did not like to work by the premium plan, that they were all doing the best they could for the company, and that it hurt them to see their old shopmate discharged.

I told him that it hurt me also to see an old hand discharged, but that, under the circumstances, there seemed nothing else to be done. "He was notified," I said, "a number of times that he was falling behind in his work, and that had he a legitimate reason, he could have spoken to the foreman, who is always willing to make a liberal allowance for hard castings or other causes of delay beyond the workman's control. If he had run behind on but one or two jobs we would have thought nothing of it, but it became chronic. Work that he used to do in sixteen hours before the introduction of the premium plan lately took him twenty-four hours and it looks to us very much as if he had agreed with some others working near him to keep his time as high as possible in order to defeat the object of the new system."

He did not think this could be true being unwilling from his knowledge of his fellow workman to believe he would be a party to any such arrangement. He suggested, as causes for the increase in time, a run of hard castings, delay in waiting for the cranes, or possibly illness. I suggested that in any such case, the man needed only to go to his foreman, and he would be sure of consideration. I then dismissed him and sent for another man who very promptly expressed his surprise that Blank had been retained by the company as long as he had. "The union" he said, "forbids its members working under either the piece work or premium system and here lies all the trouble. There is no question but that the premium plan is all right but you can't get them to see the difference between it and piece work. I understand that they have resolved upon making a general strike in all shops using either of these systems, not only in Cincinnati, but throughout the country."

The later action of the I. A. of M. at the Buffalo convention, and the unsuccessful machinists' strike of the past summer are now matters of history and the shops of the Bickford Drill & Tool Co. are today operating under the premium plan and extending its sphere of influence as rapidly as occasion permits.

Practical Workings.

The results obtained are entirely satisfactory. Fig. 2 represents the front and back of one of our comparative time cards upon which is given the time consumed on each shop order in performing the several operations on one of our staple articles of manufacture. The time limits on this work were fixed at

27 hours for boring 66 for planing and 27 for drilling and tapping; the actual times consumed on the last order were 18, 48 and 18 hours respectively, showing a total time saving of

COMPARATIVE TIME CARD.

Symbol 2 m 14. Head. Time on 6 Pcs.

	Operations.	Time.	S. U.	Mach.
1	Boring	27		
2	Planing	66		
3	Drilling and tapping	27		
4				

Remarks: Time limit was fixed on completion of order 379.

Order.	Job.	1	2	3	4
132		28	86¾	33¾	
277		27¼	81	29¼	
315		27	69	24½	
379		21¼	63	20	
423		21½	53	19¼	
576		20	51	18½	
632		19	49½	18	
1127		18	48		

FIG. 2—FRONT AND BACK OF COMPARATIVE TIME CARD.

thirty-six hours, or a cash gain of $8.82 which was equally divided between the workman and ourselves, $4.41 going to the workman and an equal amount to us. But, of course, the gain to us does not stop here, that due to the increased output of our plant being additional to the immediate cash gain.

The saving in time on the job first cited is as 70 is to 100; to show that cuts of this amount are in no way unusual, I give in Fig. 3 in table form the results obtained by one of our employes in 1770 hours' continuous work under the premium plan in which the new time is to the old as 1770 is to 2,500, or as 70.8 is to 100.

This table shows the time consumed in performing the same

Item.	No. pieces in lot.	Time limit.	Actual time.	Premium earned.	Former wage cost.	Present wage cost.
1	2	20	14.	$ .78	$ 5.20	$ 4.42
2	18	62	50.50	2 80	18.75	15.92
3	18	180	126.75	6 92	46.82	39 88
4	6	30	23 25	88	7.80	6.92
5	"	"	20.75	1.20	"	6.60
6	"	"	20.50	1.24	"	6 54
7	"	"	20.50	1 24	"	6.54
8	"	"	20 25	1.26	"	6.52
9	"	"	18.	1.56	"	6 24
10	"	"	18.	2.80	20.80	18.00
11	16	80	58.50	2.96	"	17 84
12	"	"	57.25	3.64	"	17 16
13	"	"	52.	1.56	17.16	15.60
14	6	66	54.	1.56	"	6.24
15	"	"	49.	2.21	"	14.95
16	"	"	48.	2.34	"	14 82
17	"	"	48.	2 34	"	14.82
18	"	"	49	2.21	17.16	14.95
19	"	54	40.	1.82	14.04	12.22
20	"	"	38.	2.08	"	11.96
21	"	"	37.50	2.15	"	11.89
22	"	"	36.	2 34	"	11.70
23	"	"	35.75	2 37	"	11.67
24	"	"	35.	2.47	"	11 67
25	12	144	103 75	5.23	87 44	32.21
26	"	"	103.50	5.26	"	32.18
27	"	"	97.	6.11	"	31.33
28	"	150	102.75	6.14	39 00	32.86
29	"	"	102.	6.25	"	32.75
30	2	26	31.50	.56	6.75	6 17
31	10	105	73.	4.16	27.30	23.14
32	6	21	16.75	.55	5.46	4.91
33	"	"	16.50	.59	"	4 87
34	"	30	23.	.91	7.80	6.89
35	12	66	42.	2.34	17.16	14.83
36	2	30	22	1.04	7.80	6.76
37	12	39	39.25	1 24	10.14	8.90
38	6	54	40 50	1.76	12.96	11.20
Total		2500 hrs.	1770 hrs.	$94.93	$650.00	$555.06

FIG. 3.

Showing the gains in wages effected in actual practice by one of the employes of the Bickford Drill & Tool Co. in 1,770 hours' continuous work under the premium plan, together with the former and present wages cost of the work.

operation on successive lots of the same piece; in one case the time was cut from 72 to 50½ hours at one leap; in another there was gradual shrinkage finally amounting to 14 hours on a time limit of 54 hours. Taken altogether this table is an excellent example of what may be expected of the premium plan, the records throughout having been made by the same man on the same tool by the same method under the same conditions.

If now I may be permitted to make a few suggestions to those who desire to introduce this system I would say first, be prepared at the outset for opposition. In no case yet where the plan has been introduced have the employes received it with any feeling other than suspicion. They appear to regard it as the entering wedge to piece work. Any management installing it must, therefore, expect to meet with considerable opposition at the start, but "even from this point of view," says Mr. Hallsey, the originator of the plan, "the system has decided advantages in that it does not involve compulsion. In the shops where it has passed the trial stage, it is uniformly popular with the men—indeed, a plan which deliberately sets out to increase wages, can hardly be otherwise when it is once understood, and it is the uniform experience that after the workings of the plan have been shown there is a steady call from the shop for more work to be given out on premiums."

The most important preliminary work is undoubtedly the making of time records. In the business I am connected with this was comparatively easy, because we never build our radial drill in lots of less than twelve, and sometimes they are made in lots of ninety-six. Records on such large quantities are reliable, and it is soon possible to fix the time limits. In engine building I believe it is not common to make in such large lots, but I presume there are always parts common to several sizes and these should be chosen by preference when preparing to introduce the system.

In the determining of time limits there must be a painstaking effort to be fair, though it must not be forgotten that there is danger of adopting too high a rate as well as too low. To illustrate, I append in Fig. 4 a table of actual records made in

Order Number.	No. Pieces in Lot.	Time Consumed	Wages per Day.	Cost per Piece.
374	6	78	$2 00	$5.20
489	6	72	2.00	4.33
524	6	56¼	2.00	3.75
769	6	54½	2.00	3.63
943	6	42¾	2 00	2.85
1128	6	40¾	2 00	2 72
1331	6	38¾	2 00	2.58
1569	6	18½	3.16	1.59
1698	6	19	3 10	1.62
1747	6	18	3.22	1.57

FIG. 4.

Showing the greatest reduction in time that has been effected under the premium plan at the works of the Bickford Drill & Tool Co.

machining ten successive lots of a certain piece of work. It so happens that this job was not offered under the premium plan until the seventh of these ten lots had been completed, when the time limit was fixed at forty hours. Immediately, from a best previous record of 38¾ hours the time was reduced to 18½ hours and finally to 18 hours.

On the other hand, too low a limit is discouraging to the men. It must be borne in mind that the premium plan is not intended to induce the poor workmen to perspire more profusely than usual in a fierce endeavor to beat records, but rather to give the high grade man a chance to earn what he really is worth. The intended effect of the plan is to preserve and strengthen the individuality of the employe and to reward him according to his ability. The employer cannot possibly gage the exact wage worth of any man, but he can by means of the premium plan make his earnings proportional to his ability, so that the mediocre man gets what he is worth in the labor market, the good man more and the best man most.

Discussion.

Mr. Wood: I should like to ask Mr. Norris one or two questions. In the first place, do I understand that your system is prevalent all through your works?

Mr. Norris: No, sir, not all through. It is impossible to apply it to everybody, because we are changing our lines, dropping old lines and branching out into new ones, and I do not want to establish a limit.

Mr. Wood: How much percentage increase in your pay roll did the introduction of the premium system entail?

Mr. Norris: I cannot answer that question off-hand. I have simply shown here the saving. I have taken different men. If I picked out a job here and there it is not a true comparison; so I take a man running one machine, and go back to the time he started in on the premium plan, and go right up to the present time, and show what he has earned and what he has saved us.

Mr. Wood: So that out of the total number of men employed about what percentage does this apply to?

Mr. Norris: I would say about 80 per cent of our machine hands.

Mr. Wood: Well, did those men, aside from the leaders that you approached personally, come to you and apply for the application of the premium plan upon their work?

Mr. Norris: Only lately; not until I fought the thing out with the union. Mr. O'Connell was down there and we exchanged letters with the *Engineering Magazine* about it and I saw him in New York, and we had that strike last summer, you know, and we gave him a pretty bad thrashing. As it is now, we have no trouble at all.

Mr. Wood: Did the union waive their objections to the premium plan?

Mr. Norris: They waived everything. Twenty-five per cent of our men came back under a lower scale of wages than that under which they went out. We knew that everybody would invest in a gambling transaction if they were assured against loss. The workmen would say to each other, "We might as well strike; we may get what we are after, and if we do not we cannot be worse off;" so I said, "We will make them worse off. If they go out on a strike they will fail to get what they are after." I said, "I am going to take those men back at a lower rate than that on which they went out." We had a positive agreement among ourselves that we would not take each other's men, so that a man could not go from my shop to any other shop without having a letter from me. You may call it a black list or anything you choose.

Mr. Wood: These men that walked out owing to the application of the premium plan, did they come back?

Mr. Norris: Those that we wanted came back.

Mr. Wood: And the rest maintained their strike?

Mr. Norris: Yes.

Mr. Wood: You have not any data, then, that gives how much you have increased your pay roll, and on the other hand, what you have gained by the introduction of the system, except in specific cases?

Mr. Norris: No.

The Chairman: Do you apply that to your erecting shop?

Mr. Norris: No.

The Chairman: Are there any other questions that any one would like to ask Mr. Norris with reference to this plan of his, that he has put into successful operation?

Mr. Armstrong: I would like to ask how the limit of time that the operation or the series of operations are to take is fixed. Is it an average of the time of all, or of several previous ones, or is it the maximum?

Mr. Norris: No, not the maximum; it is more likely to be the minimum. You have got to use your judgment in that. I think the premium plan is a greater test of the management of the company than anything else. You have to choose the time limits with the greatest care.

A Member: I would like to ask what guided you in fixing that limit?

Mr. Norris: A good cost system.

Mr. Bagg: Did you see a recent article written by a man by the name of Baker, in which he proposed to take the speed of his tool, whatever it was, the width of its cut, taking into consideration the quality of the steel, and material, and figuring up the exact theoretical performance of that tool, and then figuring his work on that basis? We have tried recently introducing a premium plan, and we fixed our standard in that way, without making any allowance whatever, but taking the speed of the tool, the width of the cut, and of course having a different constant for different material, and we fixed our standard in that way and came very close to it.

Mr. Norris: I believe the Bethlehem Iron Co. are using some such system as that.

A Member: I would like to ask how you arrived at the time for chucking or changing the piece?

Mr. Bagg: That has to be estimated.

Mr. Armstrong: I would like to ask Mr. Norris how he manages when he brings out a new design about getting the time. I had several years' experience with the premium system preparatory to piece work, but in engine work there is constantly something new, and it is always the case, if you take your old records, and bring out anything new or make a new record by day's work, if a man knows he is making that record for himself or other men to win premiums on, it is not a very good incentive to make a record, and we have found that we just simply had to stand over the thing, and it is cheaper to go to work and find out what it would cost and make a piece rate, and then use the piece work system just as we use the premium plan; that is, pay them their day's wages, and if they make any more money by the piece work than they would by their day's wages, they get that; so that after several years of the use of the premium plan it finally developed into that. I would like to ask Mr. Norris if he has found that difficulty in starting a new design?

Mr. Norris: We have found it expedient to split up our work into small gangs. A few years ago we had one foreman over a floor. As it is now, we have one foreman over every ten men. Now, we put a foreman over a bunch of large lathes, and a foreman over a group of small lathes, and when new work comes out, the foreman does the job himself first and fixes the time limit. But that is one of the advantages of the premium plan. Suppose you fixed it too high; the employer only loses half of the error. In piece work, no matter what the output, you continue to pay him the same price per piece, but in the premium plan the more work he turns out the less he gets per piece of his output.

Mr. Armstrong: Do you find it easier to satisfy the workmen with the rate in that way?

Mr. Norris: Yes, because we try to be liberal with them.

A Member: What is the distinction between that and piece work in, for instance, a man working on day's work, if he has made his record, and you put him on piece work and guarantee him that his wages shall not fall below what he has been making, and that he shall share in the reduction that he can make?

Mr. Norris: In introducing piece work it is customary to fix the rates about 20 per cent. lower than under the ordinary rate. I know they do in Cincinnati, but under the premium plan, you take the average time, or a fair time. A man knows he has been turning that work out in ten hours; well, you say, "You can do this in ten hours, and if you beat your time you can get the benefit of it;" and thus there is no controversy. Ten hours is taken as a basis.

A Member: Under that agreement do you find there is any disposition on their part to want to work only eight hours, so as to have more time for intellectual development on their part?

Mr. Norris: Prior to a year ago, yes.

The American Metal Hose Co., 40 Dearborn St., Chicago, is putting on the market for the conveyance of corrosive oils and steam under high pressure a hose which, though made entirely of metal, is more flexible than rubber hose of equal dimensions and is of about the same weight. The following firms in Chicago are using double metal hose under high steam pressure: Chicago Edison Co., Illinois Steel Co., Standard Oil Co., Metropolitan Elevated Railway Co., South Side Elevated Railway Co., Illinois Central Railway Co., Nelson, Morris & Co., McCormick Harvesting Machine Co., and Milwaukee Automobile Co. An illustrated descriptive pamphlet will be sent on request.

Deere & Co., Moline, Ill., will install an electric plant to furnish light, heat and power for its works. The equipment will include two 500-h. p. Allis vertical engines, direct connected with two 300-kilowatt generators. There will be a 200-kilowatt generator as a reserve. There will be additional boilers, including two of 250-h. p. and from 36 to 50 meters, of various capacities, to be located in the different departments.

INDUSTRIAL SUMMARY.

[If you are in need of machinery of any description, please notify *The Iron Trade Review*, and we will put you in communication with our advertisers at once.]

New Buyers in the Market and Some of their Wants:—

The Amet Engine Co., of Waukegan, Mich., has been incorporated with $10,000 capital to manufacture an engine to be known as a hydrothermic machine. E. H. Amet, H. M. Legnerd and J. T. Adams are the incorporators.

The Chicago Stock Machine Mfg. Co. of Chicago, Ill., has been incorporated with $30,000 capital, to manufacture machinery. M. R. Randall, J. E. Randall and O. P. Olson are the incorporators.

The Detroit Machine & Valve Co. of Detroit, Mich., has been incorporated with $10,000 capital. E. H. Sloman is the principal stockholder.

The Fargo Bridge & Iron Co. of Fargo, N. D., has been incorporated with $50,000 capital. E. E. Donley, R. H. Coshum, J. D. Benton, D. B. Holt and H. W. Gearey are the incorporators.

The Dow Composing Machine Co. of Phœnicia, Ulster county, N. Y., has been incorporated with a capital of $3,000,000, to manufacture type and type-setting machines. Julian Florian, Sidney R. Perry, A. D. Robertson, W. S. Gordon, J. N. H. Slee, F. C. Garmany, J. A. Eckert, W. G. Peet, A. T. Latson, W. W. Wilson, J. I. Bergen and V. H. Emerson.

It is reported that L. J. Hayward, secretary of the American Steel Foundry Co. of St. Louis, Mo., will resign shortly to promote a new company for the manufacture of steel castings. It is said that the capital will be $1,000,000.

The Dillon Iron Works of Denver, Col., has been incorporated with $25,000 capital. F. M. Dillon, H. M. Williamson, W. G. Wilson and George A. Adams are the incorporators.

The Indiana Chain Works of Jeffersonville, Ind., has been incorporated with $50,000 capital to manufacture chains. H. W. Buttorff, M. T. Horner and P. C. Buttorff are the incorporators.

The National Mfg. & Supply Co. of Saginaw, Mich., has been incorporated with $25,000 capital to manufacture machinery and machinists' tools and to also act as agents for mill, railroad and other supplies. J. D. Swartwood is president and treasurer and H. L. Ansted is vice-president and general manager.

The Broadrick-Quinlan Co. of Montpelier, Ind., has been incorporated with $50,000 capital to manufacture boilers. W. and M. Broadrick and H. Quinlan are the incorporators.

The Western Engineering Co. of Lincoln, Neb., has been incorporated with $75,000 capital to sell machinery and general mill supplies. H. H. Patterson, J. H. Rogers and J. T. Burke N. Catterson and J. H. Wood are the incorporators.

The Matthews Steel Casting Co. of Matthews, Ind., has been incorporated with $50,000 capital for the purpose of operating a foundry for the production of car wheels and castings for railroads and steamships. John Clifton, George N. Catterson and J. H. Wood are the in corporators.

The Sperry Hardware Co. of Kalamazoo, Mich., has been incorporated with $20,000 capital. The incorporated concern is the outgrowth of the hardware firm of George Sperry.

The Hough Gasoline Engine Co. of Albion, Mich., will be organized to manufacture the Hough engine. The incorporators will be W. D. Brundage, E. C. Lester and D. M. Hough.

The Car Wheel Trueing Brake Shoe Co. of Buffalo, N. Y., has been incorporated with $100,000 capital for the purpose of manufacturing a wheel trueing device composed of carborundum. A plant for the manufacture of these shoes will be erected at Buffalo. J. B. Perry is president of the company.

The Centre Foundry & Machine Co., of Wheeling, W. Va., has been incorporated with $50,000 capital for the purpose of operating a foundry. M. N. Cecil, S. Cecil, B. Cecil, A. T. Young and M. Young are the incorporators.

The Power Transmitter Co. of Half Moon, N. Y., has been incorporated with $50,000 capital by Patrick Egan, M. J. Egan and Thomas Greenwood.

The Hard Steel Wire Fence Co., of Cuyahoga Falls, O., has been incorporated with $10,000 capital. A plant will be erected in the vicinity of that of the Cuyahoga Steel & Wire Co. and the product from the latter will be used in making fence wire. R. R. Littlefield, C. E. Wise, D. N. Williams, George Reid and T. G. Fehan are the incorporators.

The Grant-Williams-Barker Co. of New York has been incorporated with $200,000 capital to manufacture iron and steel. Robert Grant, Frank Williams and A. K. Barker are the incorporators.

The Columbus Stove Co. of Columbus, O., has been incorporated with $50,000 capital. J. W. Hastings, F. B. Everett, J. C. Campbell, S. F. Jones and G. A. Willing are the incorporators.

The American Tool & Motor Co. of Rochester, N. Y., has been incorporated with $10,000 capital. D. J. Coakley, E. G. Wulff and B. C. Wheeler are the incorporators.

The Davis, Walker & Cooper Co. of Youngstown, O., has been incorporated with $50,000 capital to do general mechanical engineering work, making a specialty of rolling mill and furnace work. At a meeting of the stockholders held last week officers were elected as follows: C. L. Walker, president; James Cooper, vice-president and general manager; E. J. Davis, secretary and treasurer. Several sites in Youngstown for the location of the plant are already under consideration and as soon as one is secured the erection of the plant will be pushed in order that work can be commenced within six months.

The United Wire & Supply Co. of Providence, R. I., has been incorporated with $1,000,000 capital. The new company takes over the properties of the Burton Wire Supply Co., of Providence, and the Standard Seamless Wire Co., Pawtucket, R. I.

The American Malleable Iron Co. of Chicago, Ill., has been incorporated with $200,000 capital for the purpose of conducting a malleable iron foundry. E. G. Lancaster, Arthur Irwin and C. H. Rawlins are the incorporators.

The Florence Phosphate, Iron & Railroad Co. of Florence, Ala., has been incorporated with $1,000,000 capital for the purpose of constructing a railroad from Florence, Ala., to Maney, Tenn. This railroad is to be built to open up the company's iron properties in Alabama and Tennessee.

The Lloyd Construction Co., Detroit, Mich., Suite 76, Home Bank Bldg., has been organized to carry on the business of gas engineers and constructors of gas works and apparatus. The company's officers are Gordon W. Lloyd, president; Ernest F. Lloyd vice-president, and Alfred G. Lloyd, contracting agent. Ernest F. Lloyd has been until recently connected with the Western Gas Construction Co., of Ft. Wayne, Ind. The Lloyd Construction Co. will buy planers, horizontal and vertical boring mills, lathes, drills and other equipment at once.

The American Motocar & Machinery Co. has received a certificate of incorporation in New Jersey and will manufacture motors. The incorporators are: Frank G. Walter, John A. MacPeak and F. R. Hansell, Camden, N. J. Capital stock, $500,000.

J. Frank Curtin, Thos. F. Curtin and Norman T. M. Mellis have incorporated the Auto Igniter Co., of Woodcliff, N. J., for the manufacture of gasoline engine igniters; capital, $50,000.

The Southern Excelsior Co., Nashville, Tenn., is in the market for a second-hand, 60 h. p. slide valve engine and a 75 h. p. boiler.

The Eagle Iron Works, Norfolk, Va., wants a large swing second-hand lathe that will swing between fifty and sixty inches; also a second-hand iron planer, average size used in jobbing shop.

The Hardie-Tynes Foundry & Machine Co., Birmingham, Ala., is in the market for a heavy engine lathe, 30 or 36-inch swing by 20-foot centers; 30x30-inch or 36-inch by 12-foot planer with two heads on the cross rail; second-hand tools wanted.

Fires and Accidents:—

The explosion of a gas engine in the plant of the Union Switch & Signal Co., Swissvale, Pa., last week damaged the plant to the extent of $1,500.

The foundry of the Kelly & Tanneyhill Co., Waterloo, Ia., was damaged to the extent of $5,000 by fire last week.

The Niedringhaus rolling mill, owned by the National

Enameling & Stamping Co., at St. Louis, Mo., was damaged to the extent of $75,000 by fire last week.

New Construction:—

The American Locomotive Co. will erect a new erecting shop at its Richmond, Va., plant. The shop will be 300 feet long, 100 feet wide and 75 feet high. Two immense cranes will be installed on runways extending the entire length of the shop.

An annealing plant will shortly be erected in connection with the plant of the Norristown Iron Co., Norristown, Pa.

The Frankford Chain Works Co., Frankford, Pa., will erect a new forge shop and office building. The former will be 30x108 feet, and the latter 16x25 feet.

The American Steel & Wire Co. will erect a color plant in connection with its Quinsigamond works, Worcester, Mass. There are to be five buildings ranging from 50 to 150 feet in length.

The Detroit Lubricator Co. will erect a new foundry and core room in connection with its plant at Detroit, Mich. The foundry will be 70x162 feet and 28 feet high. The Penberthy Injector Co., of Detroit, will also erect a new foundry 60x36 feet.

Wonham & Major, 29 Broadway, N. Y., have under consideration the erection of a steel plant near New York. Mr. Fischer Clark, formerly assistant superintendent of the Fox Pressed Steel Car plant of the Pressed Steel Car Co., Pittsburg, Pa., is to be manager of the plant.

The H. D. Wilcox Mfg. Co., of Mechanicsburg, Pa., manufacturers of carriage hardware, gun and special forgings, are contemplating the erection of a rolling mill.

The Fort Pitt Bridge Co., Canonsburg, Pa., are contemplating the erection of an addition to their plant.

The Driver-Harris Wire Co., Newark, N. J., will build an addition to their plant, 40x100 feet.

The N. A. Christensen Engineering Co., Milwaukee, Wis., will build a five-story addition to its plant on Park Place.

The Racine Wagon & Carriage Co., Racine, Wis., is receiving bids for the construction and equipment of its new plant.

The Penberthy Injector Co., Detroit, Mich., has had plans prepared for a one-story building, 60x36 feet.

The American Fence Co., Pekin, Ill., recently incorporated, is receiving machinery for its plant, which, it is hoped will be in operation Feb. 1. W. J. Conzelman is president and C. Stagner, secretary.

Construction on a brick machine shop, 28x110 feet, will shortly be commenced at Alton, Ill., to be occupied by George D. Hayden Machine Co., of that city.

The R. M. Eddy Foundry Co., Chicago, has purchased a plot of land, 90x100, adjoining its plant, and will erect thereon an extension to its foundry. The addition, it is stated, will cost in the neighborhood of $40,000.

The Alabama Iron Works, Mobile, Ala., has let contracts for the erection of a two-story building, 96x62 feet. It will be equipped with a traveling crane of 50 tons' capacity.

The Poole Broom Corn Harvester Co., Wichita, Kas., has been incorporated with a capital stock of $10,000. A plant will be erected this summer for the manufacture of machines for harvesting broom corn.

The new plant of the Buckeye Malleable Iron & Coupler Co., Columbus, O., now under construction, will give a largely increased capacity. Several months will be required for its completion. A steel foundry is also being built, having two open hearth furnaces of 10 and 20 tons capacity respectively.

The Richmond Locomotive Works, Richmond, Va., has awarded contracts for the erection of additional shops, costing $100,000.

Rapid progress is being made in the construction of the new shops for the American Machine Co., Louisville, Ky. The plant will consist of a machine shop, 50x150 feet, 40 feet high, equipped with traveling crane; foundry, 45x150 feet; smith shop, 25x50 feet; wood shop, 68x100 feet, 2½ stories. The following tools and equipment will be added to that already installed: One 72-inch Niles full universal radial drill, one special 72-inch Niles horizontal boring and turning mill, one keyseat slotting machine, several small drill presses and lathes. The smith shop will be equipped with hand, traveling and gib cranes, steam hammer, belt threading machine, punch, shears, bending rolls, blast fans, etc.; the foundry building with traveling crane, cupola of 5 tons capacity, blast fan, casting mill, etc.; the wood shop with planer, jointer, cross and rip saws, boring and turning machine, band saw and wood lathe. The company has yet to place orders for the material above mentioned, with the exception of radial drill and boring mill. Orders have been placed for one Houston, Stanwood & Gamble 75-h. p. engine, and one 100-h. p. horizontal tubular boiler. The plant will be steam-heated, lighted by electricity, and the machinery motor-driven.

The Mitchell & Lewis Co., Ltd., Racine, Wis., will add to its plant two four-story buildings, one 120x545 feet, and the other 120x384. Construction will be commenced as soon as the weather permits.

Plans have been made for a foundry, corehouse, etc., 70x162 feet, for the Detroit Lubricator Co., Detroit, Mich. C. B. Hodges, manager, Lincoln avenue. The building will be constructed of brick, have composition roof, steam heat, metal skylights, etc.

Cook & McLaurie, of Montgomery, Ala., have contract for erection of new plant of Alabama Iron Works, Mobile, Ala. The building will be two stories, of brick, 96x62 feet, and equipped with an overhead traveling crane of 50 tons capacity.

The Wheeling Roofing & Cornice Co., of Wheeling, W. Va., is said to be preparing to build a large plant at New Martinsville, W. Va., and to remove the Wheeling plant to that point.

The contract for constructing the steel foundry for the E. & G. Brooke Iron Co., at Birdsboro, Pa., after plans by S. V. Huber & Co., Pittsburg, has been let to L. H. Focht, of Reading. The building will be of brick and iron, 248x220 feet, with an addition, 62x140 feet.

The Juniata Iron & Steel Co. has been organized with a capital of $250,000, and is reported to have projected a tin plate plant at Greencastle, Ind.

Plans have been prepared for a brick machine shop, 28x110 feet, for H. M. Schneppe, at Alton, Ill., to be occupied by the George D. Hayden Machine Co.

The Philadelphia Pneumatic Tool Co., of Philadelphia, expects to let the contract this week for its new building, on 21st St., below Allegheny Ave., alongside the Philadelphia & Reading railroad tracks. The shop will be one story, with a basement, 96x130 feet, with side extension for boiler house, 24x44 feet. The engine room will be located in the basement, and there will be installed an 80-h. p. engine, together with direct connected generating unit for lighting, etc. The boiler will be 60 inches by 16 feet, of the return tubular type, and the stack will be a round, hollow tile, brick chimney 70 feet in height. The interior construction and roof frame for the building will be of yellow pine with slag roof. The roof will have four lanterns or sky-lights, extending transversely of the building. The main flooor will be free from partitions except in one corner where the offices are located. The company will occupy the building about May 1. A considerable number of new machine tools will be installed now. This new plant will be easy of access from the central part of the city by train on the Philadelphia & Reading from the Reading terminal, 12th & Market Sts., to 22nd street station on the Norristown division, or from Broad Street station to Westmoreland station on the Germantown division, Pennsylvania R. R., or it can be reached by trolley cars of the 18th and 20th St. lines, which run out Sansom street. The shop will be equipped with steam heating plant, modern toilet arrangements, lockers for the men and everything to make it a complete modern machine shop.

The Pittsburg District:—

Hyde Bros., of Pittsburg, manufacturers of the Hyde Water Tube Boiler, have received an order from the American Car & Foundry Co. of St. Louis, Mo., for a 1,000-h. p. boiler plant. This is the fourth order for boilers received from this company.

The G. L. Bollinger Co. of Pittsburg, structural engineers, have secured a site at Verona, Pa., for the erection of a structural plant. The contract for a structural shop 50x100 feet, has already been let. The machinery for the plant has been purchased and it will be completed about April 1.

The Kinzer-Jones Co. of Pittsburg, which has operated a

foundry for many years on Penn Ave., Pittsburg, near the Point, has secured a site for a new plant at Washington, Pa. Operations on the new plant will be commenced shortly. The site of the present foundry is a portion of the Schenley holdings upon which the large Point warehouse is to be erected.

David Lamond & Son, blast furnace engineers and contractors, have been awarded a contract for the erection of three two-pass stoves each 85x19 feet, by the Central Iron & Coal Co. of Tuscaloosa, Ala.

J. D. Lyon & Co., merchant engineers, Fitzsimmons building, Pittsburg, have received orders for two 60-h. p. Mertes duplex gas engines, built by the National Gear Wheel & Foundry Co. of Allegheny, Pa. The one engine will be installed in the plant of the Pittsburg Clay Pot Co., Allegheny, Pa., and the other in the plant of C. K. Hill, Seventh Ave. and Liberty St., Pittsburg.

Julian Kennedy, consulting engineer, is preparing plans for the new furnace of the Rochester & Pittsburg Coal Co., to be erected between Falls Creek and Dubois, Pa. The furnace will be 80x19 feet and will operate on foundry iron. The project is promoted by the Buffalo, Rochester & Pittsburg Railway Co., as the furnace will operate as a feeder for this road. Foundry iron can be shipped advantageously from this point to Pittsburg, Buffalo and points in Southern New York. The furnace is to be completed early in 1903.

The Phœnix Brass Foundry Co. of Pittsburg, operating a plant on 28th and Smallman Sts., has been placed in the hands of a receiver. J. Solomon was the applicant for the receivership and Robert McMillen has been placed in charge.

The 128-inch mill of the Homestead Steel Works of the Carnegie Steel Co. broke the world's record on Saturday, Jan. 18, for a 24 hours' run on sheared plates. During this period 1,049 tons of plates were turned out as compared with 788 tons the best previous record.

The Riter-Conley Mfg. Co. of Pittsburg has been awarded contracts for the erection of two petroleum tanks in Hawaii. About 400 tons of steel will be required in their construction.

General Industrial Notes:—

It is reported that Eastern creditors of the Hartman Mfg. Co., of New Castle, Pa., are attempting to carry out the original plan for the consolidation of this company and the Cuyahoga Steel & Wire Co. of Cuyahoga Falls, O., whose plant was acquired by the Hartman company. In case the arrangement is made it is expected that E. A. Henry, president and general manager of the Cuyahoga Falls plant, will have the New Castle plant in charge also.

J. B. Campbell, special commissioner, will sell the boiler works of the J. C. McNeil Co., Akron, O., on Feb. 20.

For the protection of the Union railroad bridge which crosses the Monongahela river at Pittsburg silica-graphite paint manufactured by the Joseph Dixon Crucible Co. was chosen. The engineers were Emil Swensson, designer and engineer of construction, and Wm. H. Smith, chief engineer, Carnegie Steel Co. The total weight of the bridge is 5,135 tons, and it has a total length of 2,328 feet. Designed for carrying molten metal from the Carrie furnace to the steel mill and raw materials to the furnaces, this steel structure is subjected to heat from the molten metal, sulphur fumes from locomotives and river steamers, also from the adjoining furnaces and steel mills. Probably no steel bridge in the world is exposed to so many and severe destructive agencies.

The Columbus Forge & Iron Co. of Columbus, O., has increased its capital stock from $50,000 to $125,000 to provide for large improvements.

The Jos. Soisson Fire Brick Co. through its manager, W. F. Soisson, has recently acquired the entire holdings of the Kingston Silica Brick Co., located at Kingston, Pa., one of the best located properties for the manufacture of silica brick in Western Pennsylvania. The silica ledge at the plant shows up a face of 40 feet by 1,000 feet long, being almost inexhaustible and the silica rock analysis 99 per cent pure silica. A vein of flint fire clay of good quality is also being worked at this plant which is found under the silica ledge. This gives the Jos. Soisson Fire Brick Co. five complete brick plants with a capacity of 150,000 brick a day, with all modern machinery and raw material for the manufacture of silica and fire brick for coke ovens, glass houses, steel mills, pipe and wire mills, foundries, tin plate plants and other purposes.

J. J. Ryan & Co., brass founders and finishers, 68-74 West Monroe street, Chicago, report receiving contracts for the brass nickel-plated trimmings for the marble closet and urinal stalls and lavatories for the following buildings: Pasavant Hospital, Mercy Hospital, Wesley Hospital, Rush Medical College, Manufacturers' building, National Life building, Chicago Commons, all of Chicago; Grand Opera House, Cincinnati; McLean County Court House, Bloomington, Ill.; Montana State Capitol, Helena; U. S. postoffice, Streator, Ill.; U. S. postoffice, Monmouth, Ill.; U. S. postoffice, Elgin, Ill.; Draper building, Honolulu, H. I.

The Best Wire Fence Co. of Detroit, Mich., has been dissolved.

The tin plate plant of the American Tin Plate Co. at Johnstown, Pa., is being dismantled and the machinery is being removed to the Monessen plant at Monessen, Pa., and the Anderson, Ind., plant.

The Allentown, Pa., blast furnaces owned by the Lehigh Coal & Navigation Co. of Philadelphia, Pa., have been leased to the Empire Steel & Iron Co. for a term of years. Repairs on the furnaces are being pushed and one of the furnaces will be blown in in March. It is the intention to operate on foundry and basic iron.

The Pennsylvania Engineering Works, New Castle, Pa., have received orders for ten ton converters from the following concerns: Shenango Valley steel plant of the National Steel Co., New Castle, Pa.; Cleveland works of the American Steel & Wire Co.; Colorado Fuel & Iron Co., and the Shoenberger plant of the American Steel & Wire Co. One ten-ton converter for the Cambria Steel Co. was recently shipped.

The Lebanon Valley Furnace, at Lebanon, Pa., owned by J. and R. Meily, which has been out of blast since last November, will be blown in within two weeks. Extensive repairs have been made and the stack relined.

The steel mill in course of erection at the Lebanon Rolling Mills, Lebanon, Pa., is progressing slowly, owing to the inability of the contractors to secure structural steel. The plant will contain one Bessemer converter and a blooming mill.

The Forsythe Pattern Co., of Youngstown, O., is negotiating for the purchase of the site of the Kaercher Electric Light Co.'s plant. A three-story brick pattern plant will be built and the present plant will probably be disposed of to the Lake Shore railroad.

At a meeting of the creditors of Diven & Bros. Co., Baltimore, Md., held last week it was decided to operate the foundry for a term of 60 days. At the meeting it was reported that a party of capitalists had offered $25,000 for the plant.

At the annual meeting of the Landis Tool Co. of Waynesboro, Pa., held last week officers for the ensuing year were re-elected as follows: Dr. A. H. Strickler, president; J. E. Frantz, secretary and treasurer, and A. B. Landis, superintendent.

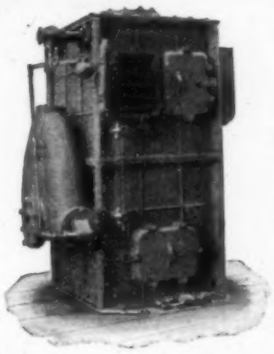
The Woodward Iron Co. of Birmingham, Ala., has increased its capital stock from $1,000,000 to $2,000,000 to provide for large improvements.

Negotiations are now pending for the removal of the plant of the Shelton Water Wheel & Machine Works from Westchester, Pa., to Richmond, Va. The company manufactures turbine water wheels and steam engines.

The new plant of the Holthoff Machinery Co., under course of erection at Cudahy, Wis., near Milwaukee, will probably be ready for the installation of machinery no later than March. The company was incorporated about six months ago with a capitalization of $600,000 for the manufacture of mining machinery.

At a meeting of the directors of the Aurora Foundry Co., Aurora, Ill., recently incorporated, officers were elected as follows: Joy Love, president and treasurer; Sam Reid, vice-president, and Fred J. Wells, secretary.

The citizens of Port Huron, Mich., have offered the Buffalo Rolled Steel Co., of Buffalo, N. Y., inducements to locate its plant in Michigan. The machinery of the Buffalo plant will shortly be removed to Port Huron where a new building 200 feet square is to be erected.



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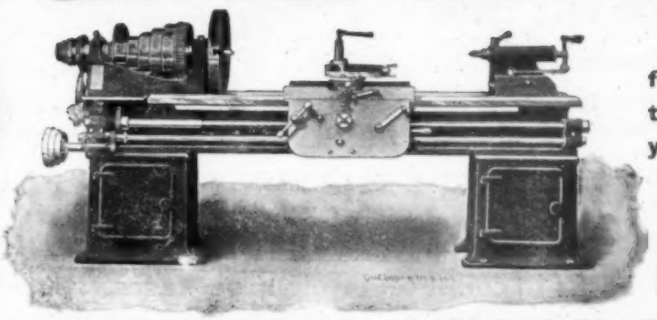

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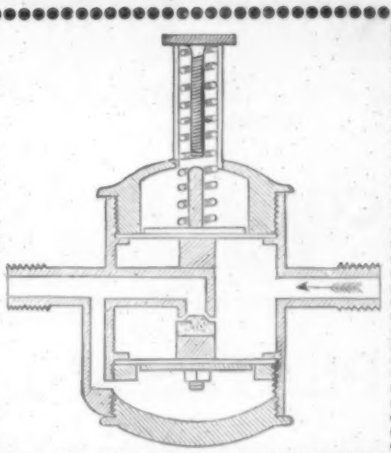

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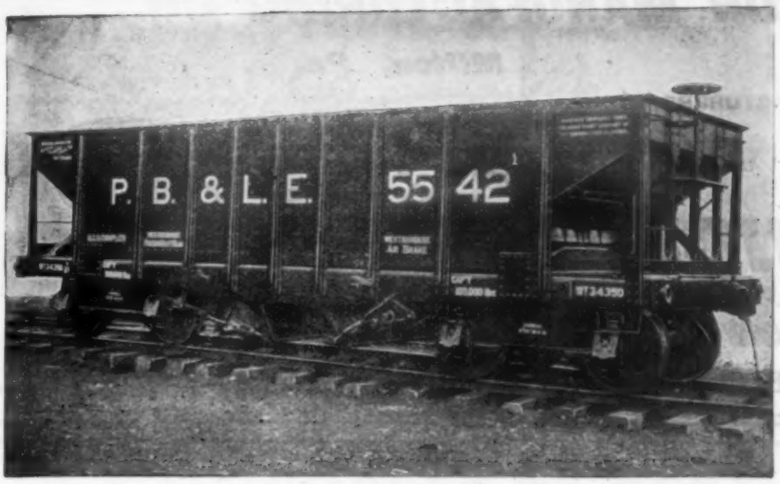

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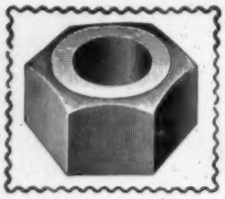

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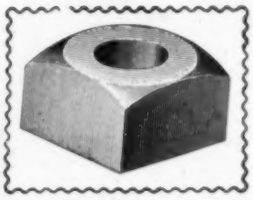

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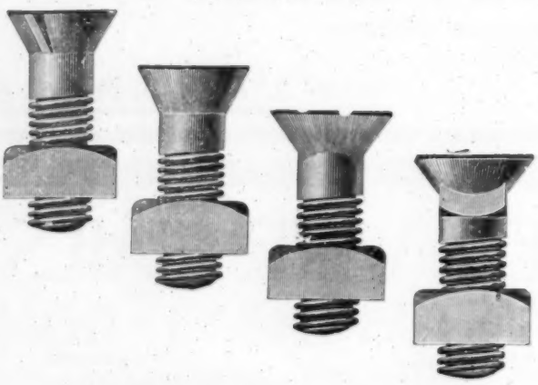

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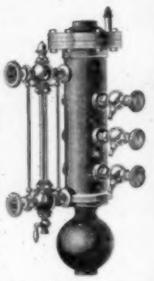

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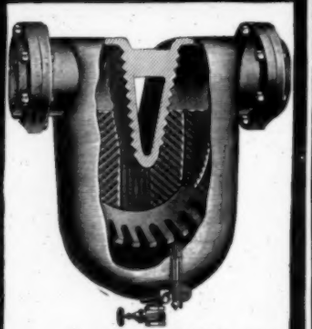

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